SPRING UNDERGRADUATE RESEARCH CONFERENCE

APRIL 10-14, 2023

PURDUE UNIVERSITY, WEST LAFAYETTE, INDIANA

SPRING UNDERGRADUATE RESEARCH CONFERENCE

SCHEDULE OF EVENTS

APRIL 11, 2023 | PMU BALLROOMS

9:00AM-10:30AM First Poster Session (100s & 200s)

11:30AM-1:00PM Second Poster Session (300s & 400s)

2:00PM-3:30PM Third Poster Session (500s & 600s)

APRIL 13, 2023 | STEW 214

9:00AM-5:00PM Research Talks (700s)

APRIL 13, 2023 | STEW 218

9:00AM-4:00PM LLLC Colloquium (800s)

APRIL 10-14, 2023 | ONLINE

Virtual presentations (900s)

Virtual presentations are available on the Spring Conference website.

We encourage those with BoilerKey access to provide feedback to presenters. **To submit feedback, please scan this QR code with your device's camera!**

POSTER SYMPOSIUM

FIRST POSTER SESSION | 9:00AM-10:30AM

100Ψ *Isabelle Adnson†*
Mentor(s): Kory Cooper; Emily Fletcher

101 *Shivangi Agarwal†*
Mentor(s): Wenzhuo Wu; Robert Santo

102 *Anish Agrawal†; Jacob Valdez†*
Mentor(s): Jesus Meza; Steven Pugia; Tony Cofer; Alina Alexeenko

103 *Efe Albay†; Benjamin Roeder†; Adithya Kolisetty†*
Mentor(s): Jesus Meza-Galvan; Steven Pugia; Anthony Cofer

104 *Heidi Althaus†; Abigail Taylor‡*
Mentor(s): Michele Buzon; Emily Eiseman

105Ω *Tamia Austin†*
Mentor(s): Ellen Wells

106 *Connor Baker†*
Mentor(s): Scott McAdam

107 *Lucy Baker†*
Mentor(s): Julie Liu; Aishwarya Menon

108 *Hannah Bard†*
Mentor(s): Ellen Wells

109 *Sandra Bern†*
Mentor(s): Heidi Parker

110 *Katelyn Biggs†*
Mentor(s): Jonathan Shannahan; Li Xia

111 *Spencer Bowles†; Michael Foster†*
Mentor(s): Peter Bermel; Jie Zhu

112 *Ethan Brady†*
Mentor(s): Kiril Datchev

113 *Isabel Cava†; Megan Morley†; Elizabeth Salwitz†; Novalee Glass†*
Mentor(s): Andrea DeMaria

114 *Hanna Cayton†*
Mentor(s): Christie Sennott

115 *Pou Hei Chan†; Wei Teng Sin‡; Chon Weng Lei‡*
Mentor(s): Byung-Cheol Min; Pou Ut Chan

116 *Shaan Chanchani†; Sohum Thadani†; Brooklynn Fugate†; Krishna Bendishankara†; Junze Li†; Zilu (Johnny) Jin†*
Mentor(s): Amy Reibman; Haoyu Chen

117 *Elizabeth Clark†; Cayla Woten‡; Sophie Donegan‡*
Mentor(s): David Purpura; Connor O'Rear

118 *Colleen Cole†*
Mentor(s): Katie Jarriel

119 *Jade Coxon†; Kioni Bush‡; et al. (see abstract)*
Mentor(s): Kari Clase; Harry Ashbaugh; Daphne Fauber; Aaron Gin; Adam Quinn

120 *Perry Curtis†; Sharon Kulali*; Rebecca Eyrick*; Hannah Bard**
Mentor(s): Ellen Wells; Edem Sededji; Salma Akhter

121 *Ajay Dalal†; Siqi He**
Mentor(s): Bill Hutzel; Dhanurja DeSilva

122 *Naomi Davis†*
Mentor(s): Ephrem Abebe

123 *Eanna Nicole DeGuzman†*
Mentor(s): Stephanie Gardner; Soumi Mukherjee

124 *Alicia Denton†*
Mentor(s): Kara Stewart; Brian Richert

125 *Tulsi Desai†*
Mentor(s): Kristine Marceau

126 *Audrey Durham†; Imani Lawrence‡*
Mentor(s): Mike Sori

127 *Calista Easterling†*
Mentor(s): Qian Wang

128 *Grace Estep†*
Mentor(s): Mike Saunders

129 *Jacob Eyster†*
Mentor(s): Jonathan Shannahan

130 *Mahad Faruqi†; Piper Hale†; Xander Shillings†*
Mentor(s): Jim Ogg; Aaron Ault

131 *James Fazioli†*
Mentor(s): Alex Pasternak; Maggie Mulligan; Kaylyn Rudy

132 *Elizabeth Fisher†*
Mentor(s): Theresa Casey

133 *Ludvik Fjeld†*
Mentor(s): Eduardo Barocio

134 *Mia Fleisher-de Kozan†*
Mentor(s): Aaron Bowman; Anke Tukker; Xueqi Tang; Jennifer Schmitz

135 *Reagan Frame†; Maia Lynch†*
Mentor(s): Laura Claxton; Paige Thompson

136 *Camryn Fulton†; Emily Davidson†*
Mentor(s): Val Watts; Brent Smith; Zlatko Janeba

137 *Veronica Galles†*
Mentor(s): Lindsay Rosokha; Arnold Chen

138 *Braden Garretson†*
Mentor(s): Danny Milisavljevic

139Ω *Chloe Garrett†; Rebecca Lewis*; Sarah Preston*; John Vanos*; Lucas Stouder*; Hannah Winstone**
Mentor(s): Chad Carroll; Wayne Campbell

140 *Philip Goldberg†*
Mentor(s): Kerrie Douglas; Shauna Adams

141 *Jaya Hari†; Akash Kumar†; Sejal Kumar†; Vidisha Singhal†; Vishal Muthuraja†; Tim Chou†; Ritvik Gupta†*
Mentor(s): Yung-Hsiang Lu

142 *Danielle Harr†*
Mentor(s): Robin Tanamachi

143 *Audrey Harrison†*
Mentor(s): Edward Bartlett; Meredith Ziliak

144 *Cameron Hartsfield†; Pattiya Pibulchinda*; Andrew Bruns**
Mentor(s): Eduardo Barocio; Garam Kim

145 *Samuel Hartzler†*
Mentor(s): Jason Hanna; Anthony Murphy

146Ω *Travis Hastreiter†; Eleazar Gonzalez†; Zack Balbo†; Connor Barnsley†*
Mentor(s): Rafael Lang; Riya Singh

147 *Jorge Hernandez†; Varun Vaidyanathan†; Kathleen O'Sullivan†*
Mentor(s): Brian Lee; Brian Lee

148 *Sabrina Hinojosa†*
Mentor(s): Zahra Tehrani

149 *Joseph Huang†; Andrew Hufford†; Kaleb Lee†; Aditya Sinha†; Tanishaa Shah†*
Mentor(s): Edward Delp; Carla Zoltowski

150 *Clare Hughes†*
Mentor(s): Michael Mickelbart; Santiago Franco Lopez

151 *William Humble†; Rachael Paston - Amos†; Joel Kuriakose†; Avery Willson†; Chandni Garg†; Lekha Durai†; Sophia Remmey†; Lukas Sizemore†; Alekhya Ankaraju†; Youssef Morad†*
Mentor(s): Kari Clase; Adam Quinn; Anjana Narayanan; Arya Shembekar; Daphne Fauber

152 *Keila Jellings†*
Mentor(s): Leonor Boavida

153 *Haseung Jun†*
Mentor(s): John Mulrow

154 *Ethan Kaser†*
Mentor(s): Sharon Kessler; Sienna Ogawa

155 *Reese Kerschner†*
Mentor(s): Steve Amireault

156 *Bethany Kettleborough†; Yulei Yang‡*
Mentor(s): Dr. Lisa Welp

157 *Sam King†*
Mentor(s): Emily Dykhuizen; Surbhi Sood; Sandra Ordonez

158 *Connor Klaassen†*
Mentor(s): Mohit Verma

159 *Sharon Kulali†; Rebecca Eyrick†; Perry Curtis*; Hannah Bard**
Mentor(s): Ellen Wells

160 *Ian Kurz†; Brandon Tso*; Abigail Valdez**
Mentor(s): Sa Liu; Marwan Alajlouni; Jung Hyun Lee; Alaina Bryant

161 *Hannyi Lee†*
Mentor(s): Ben Denos; Sushrut Karmarkar; Andreas Jung

162 *Jueqing Li†*
Mentor(s): Jill Newton; Doris Fulwider

163 *Jia Le Lim†*
Mentor(s): Qian Wang

164 *Hannah Lipps†*
Mentor(s): Erik Otarola-Castillo

165 *Santiago Lopez†*
Mentor(s): Alex Ruichao Ma; Botao Du

166 *Ethan Lu†; Jinen Setpal†; Colby Acton†; Enze Jiang†; Vinay Jagan†; Riya Varshney†; Troy Madden‡; Yunhao Lan‡; Harsh Ajwani‡; Aaron Fritz‡*
Mentor(s): Wei Zakharov; Qiang Qiu; Zichen Miao

167 *Luke Luschwitz†*
Mentor(s): Matthew Swabey

168 *Arth Maindarkar†*
Mentor(s): Yang Yang

169 *Pulkit Manchanda†; Maesa Ogas**
Mentor(s): Megha Anwer

170 *Gabriel Mason†*
Mentor(s): Zahra Tehrani

171 *Sophie Mbongo†*
Mentor(s): Amanda Veile

172 *Nicolas Medel†*
Mentor(s): Jonathan Shannahan; Christina Ferreira; Saeed Alqahtani

173 *Micaela Menchaca†*
Mentor(s): Signe Kastberg; Helen Bentley; Stephanie Oudghiri

174 *Breeann Mild†*
Mentor(s): Jennifer Freeman

175 *Suyash Mishra†; Anshul Kulkarni†; Aayush Patel†; Philip James†*
Mentor(s): Shreya Ghosh

176 *Emily Morales Liddiard†*
Mentor(s): Ignacio Camarillo

177 *Emily Morales Liddiard†*
Mentor(s): Zahra Tehrani

178 *Jackson Murray†*
Mentor(s): Paul Parsons; Zixu Zhang

179 *Jackson Murray†*
Mentor(s): Doug Osman

180 *Annelise Nauman†*
Mentor(s): Younjeong Choi; Elijah Openiyi; Linda Lee

181 *Sam Nemeth†*
Mentor(s): Patti Thomas

182 *Maesa Ogas†*
Mentor(s): Megha Anwer

183 *Matthieu Opdyke†; Andrew Swanback†; Corey Auerbach†; Cam Johnson†; Evan Kamm†; Aidan Bilger†; Leonard Jung†; John Rolfe†; Eric O'Keefe‡; Mahesh Madhavan‡*
Mentor(s): Shreyas Sundaram; Charles D'Onofrio

184 *Kennedy Outlaw†*
Mentor(s): Angeline Lyon; Isaac Fisher

185 *Manas Paranjape†; Robert Gentle†; Siwen Hu†; Robert Rozhanskyy†*
Mentor(s): Dave Barbarash

186 *Kareena Patel†*
Mentor(s): Christopher Cayari

187 *Nicholas Pecoraro†; Shane Limas†*
Mentor(s): Jae Park; Chang Geun Lee

188 *Sanika Pelnekar†*
Mentor(s): Angeline Lyon; Kadidia Samassekou; Elisabeth Garland

189 *Mei Phillips†*
Mentor(s): Deva Chan; Rahaf Salim

190 *Holly Pickett†*
Mentor(s): Lisa Hilliard

191 *Daniel Pinzon Quintero†; Julieta Aguilar**
Mentor(s): Jeremy Reynolds; Reilly Kate Kincaid

192 *Noelle Plucinsky†*
Mentor(s): Josh Weirick; Jiyeon Lee

193 *Evan Pogue†; Nicholas Buffo‡*
Mentor(s): Uzay Emir; Deva Chan; Cameron Villarreal

194Ψ *Brooke Price†; Madeleine Yang†*
Mentor(s): Swati Srivastava

195 *Abhirakshak Raja†*
Mentor(s): James Davis

196 *Nicholas Rasmusson†; Luke Lenz†; Caden Kuang†; Austin Adkins†; Cheran Senthil Kumar†*
Mentor(s): Shreya Ghosh

197 *Noah Rediker†*
Mentor(s): Mark Johnson

198 *Emma Rekeweg†*
Mentor(s): Jason Harris; Theodore Thomas

199 *Olivia Richter†*
Mentor(s): Elliott Friedman

200 *Alexia Rodrigues†; Alex Liu†*
Mentor(s): Pengyi Shi

201 *Braden Rutledge†; Jenna McLean†; Connor Meek†; Ryan Buencamino†; Mario Perez-Ahuatl†; Susan Lintott†; Francesca Hamacher†; Grace May†; Gabriela Surdyka†; Ella Jameson†; Kay Annunziata†*
Mentor(s): Kari Clase; Aaron Gin; Jason Lee; Quintin Walter; Brady Stinson-Smith

202 *Tushar Sardesai†*
Mentor(s): Philip Low; Bo Huang

203Ψ *Anusha Sarraf†*
Mentor(s): Gaurav Nanda; Romila Pradhan

204Ω *Riley Schellingerhout†*
Mentor(s): Alvin Kao

205 *Kathryn Schwartzman†; Victoria Patellos*; Elaine Esposito*; Cameron Robinson**
Mentor(s): Kim Kinzig; Brent Bachman

206 *Nadia Seye†*
Mentor(s): Jiyeon Lee; Joshua Weirick; Willem van Boxtel

207 *Yiyang Shui†; Boheng Zhao†; Edmund Leung†*
Mentor(s): Cole Nelson; Mark Johnson

208 *Victoria Sinfield†*
Mentor(s): Eric Nauman

209 *Yubo Song†*
Mentor(s): Zahra Tehrani

210 *Samarah Sorin†*
Mentor(s): Robert Proctor; Jeongyun Choi

211Ω *Stephanie Sotelo†*
Mentor(s): Tzu-Wen Cross; Andi Cheng; Chandnee Chandrasekaran; Jean-Christophe Rochet

212 *Priyanka Subrahmanyam†*
Mentor(s): Erin Hennes; Janel Jett

213 *Daanish Suhail†; Aaryan Srivastava†; Daniel Chen†; Seeun Kim†*
Mentor(s): Chih-Chun Wang; David Love; James Krogmeier

214Ω *Kaitlyn Sycko†*
Mentor(s): Michelle Thompson; Alexander Kling

215 *Ata Tamer†*
Mentor(s): Mesut Akdere

216 *Patrick Thompson†*
Mentor(s): Shubhra Bansal

217Ω *Ata Toraman†; Philip Voronin†; Abhirama Rachabatturni†; Efe Albay‡; Adithya Kolisetty‡; Benjamin Roeder‡*
Mentor(s): Jesus Meza-Galvan; Steven Pugia; Anthony Cofer; Alina Alexeenko

218 *Thuc Tran Phu†*
Mentor(s): Jianing Li

219 *Caitlin Truffer†*
Mentor(s): Dorothy Teegarden; Marjorie Layosa; Emily Hicks

220 *Varisra Upatising†*
Mentor(s): Yuan H. Brad Kim; Jinkyu Seo; Madison Romanyk; Saud Ur Rehman

221 *Riya Varshney†; Hasan Sultan†; Shriya Gupta†; Charlie Tamer†; Varun Vaidyanathan†; Digvijay Pawar†; Minrui Lu†; Dhruv Shah†; Dheeraj Namargomala†; Vanamali Vemparala†*
Mentor(s): Charles D'Onofrio; Yu-Chieh Chiao; Charles D'Onofrio

222 *Alexa Vesey†*
Mentor(s): Alex Pasternak

223 *Sheridan Vik†*
Mentor(s): Renee Murray

224Ω *Grace Vukovich†; Skylar Day†; Kaylie Katsiris**
Mentor(s): Andrea DeMaria; Chandler Dykstra

225 *Morgan Walsh†*
Mentor(s): Kara Stewart; Griffin Nicholls

226 *Ellen Wei†; Natalie Galvan**
Mentor(s): John Tesmer; Yueyi Chen

227 *Serena Wesley†; Collette Plue†; Isabella Taylor†*
Mentor(s): Greg Fraley; Jeff Lucas; Jenna Schober; Melanie Bergman

228 *Aubrey Williams†*
Mentor(s): Krystal Hans

229 *Helen Willis†; Kaylee Patterson‡; Brianna Coster‡; Isabel Pati‡*
Mentor(s): Jessica Huber

230 *Emma Zaicow†*
Mentor(s): Kara Stewart; Taw Scaff

231 *Minjing Zhao†; FNU Archie‡*
Mentor(s): Garam Kim; Eduardo Barocio

232 *Xinyi Zhou†*
Mentor(s): Jingjing Liang

233 *Caroline Zu†*
Mentor(s): Elizabeth Parkinson; Lauren Wilbanks

SECOND POSTER SESSION | 11:30AM-1:00PM

300 *Soham Agarwal†; Om Patel†; Jordan Srinivasan‡*
Mentor(s): Carla Zoltowski; Edward Delp

301 *Emily Aicher†; Ryan Dreves*; Elissa Weinrick**
Mentor(s): Abby Engelberth

302 *David Amieva†*
Mentor(s): John Sutherland; Fu Zhao; Jesus Ramon Perez-Cardona

303 *David Arteaga†*
Mentor(s): Andrea Kasinski; Zulaida Soto-Vargas; Humna Hasan; Ikjot Sohal

304 *Samantha Barker†*
Mentor(s): Cankui Zhang; Jing Huang

305 *Victoria Berch†; Lynn Willems**
Mentor(s): Laurent Couetil; Katy Ivester; Laura Murray

306 *Allison Biewenga†*
Mentor(s): Denny Yu; Marian Obuseh

307 *Anthony Bovenschen†; Nicholas Pecoraro‡*
Mentor(s): Jae Park; Subin Han

308 *Evan Carr†; Peter Suarez†*
Mentor(s): Janelle Wharry

309 *Kaubfar Changkanjana†; Talia Thornton‡; Sidney Schwartz‡*
Mentor(s): Matthew Scarpelli; MacKenzie Coon

310 *Timothy Chen†*
Mentor(s): Carol Handwerker; Yifan Wu

311 *Coco Chen†; Maya Francisco†; Mary Neuman†*
Mentor(s): Petronio Bendito

312 *Sung Jun Choi†; Harry Lee**
Mentor(s): Garam Kim

313 *Kashif Chowdhury†*
Mentor(s): Raluca Ostafe

314 *Ethan Christie†*
Mentor(s): Carol Handwerker; Lijia Xie; Hannah Fowler

315 *Quinn Clemenz†*
Mentor(s): Elliot Friedman

316 *Brandon Cole†; Zhuokun Liu†; Rohan Gangaraju†; Devin Singh†*
Mentor(s): Cole Nelson; Mark Johnson

317 *Grace Cook†*
Mentor(s): Leopold Green

318 *Erin Creager†*
Mentor(s): Yang Yang; Xiaoling Chen; Jingliang Zhang

319 *Ronald Cutler†*
Mentor(s): Julia Laskin; Hugo Samayoa-Oviedo

320 *Soumalya Das†; Andy Lin‡; Sitara Iyer‡; Vijay Tummalapenta‡; Lucas Manalo‡*
Mentor(s): Mark Johnson; Jude Pinto; Cole Nelson

321 *Lauren Davern†; Annika Patel†; Reagan Long†; Carissa Chane†; Christiana Whittey†; Brooke Yorio†; Natasha Macarchuk†; Maya Driscoll†; Sarina Lee†; Ben Goncher†*
Mentor(s): Kari Clase; Harry Ashbaugh; Amanda Blankenberger; Morgan Gyger; Rebecca Mold

322 *Lukas Dolidze†; Kevin Ryu†*
Mentor(s): Seema Mattoo

323 *Alice Dragnea†*
Mentor(s): James Goppert

324 *Giovanna Durante†*
Mentor(s): Chao Cai

325 *Wesley Dynlacht†*
Mentor(s): Bobby Chastain

326 *Garret Eatinger†; Vaishakh Deshpande†; Tyler Lagowski†; Brandon Liu†*
Mentor(s): Matthew Swabey

327 *Kai Ze Ee†*
Mentor(s): Peter Bermel; Jie Zhu; Changkyun Lee

328 *David Estrella†*
Mentor(s): Jeffrey Youngblood

329 *Samantha Ferengul†*
Mentor(s): Thomas Siegmund; Elizabeth Montagnino

330Ω *Aaron Fernandes†; Andres Gomez‡; Elizabeth Bradshaw‡; Elliot Wong‡*
Mentor(s): Peter Bermel; Allen Garner; Stylianos Chatzidakis; Charles Grey

332 *Kylee Gall†*
Mentor(s): Lisa Hilliard

333 *Lauren Gartenhaus†; Mae Shu‡; Emma Terwilliger‡*
Mentor(s): Jason Hanna; Annaleigh Powell

334 *Wyatt Gay†; Hannah Gagelin*; Aidan Crowley*; Alina Stuleanu**
Mentor(s): Amy Marconnet; Ritwik Kulkarni; Pranay Nagrani

335 *Charlie Geis†; Dustin Rabin†*
Mentor(s): Wan Ting Chiu

336 *Hunter Gregory†*
Mentor(s): Fiona Wang

337 *Elizabeth Grivetti†; Allison Garrard†; Molly Dye†; Samuel Nasternak†; William Townsend†; Priya Veluri†; Jacob Paris†; Courtney Usher†; Meera Pala†; Aaron Haynos†; Jacob Wilder†*
Mentor(s): Kari Clase; Harry Ashbaugh; Daphne Fauber; Aaron Gin; Adam Quinn

338 *Meghan Gron†; Blake Iftiger*; Conor McCarthy*; Saichandana Pothireddy*; Justin Lesinski*; Hongyi Shen**
Mentor(s): Wenzhuo Wu; Nachiket Vatkar

339 *Jerry Gu†*
Mentor(s): Guang Lin

340Ψ *Jarren Haggard†; Mikayla Klemp†*
Mentor(s): Kory Cooper; Kelly Lippie

341 *Hope Harlow†; Muhan Wang*; Conrad Otterbacher**
Mentor(s): Yang Yang; Maria Olivero-Acosta

342 *Simon Hasik†; Moses Hamm†; Mikko Chapman†; Aaron Coppeta†*
Mentor(s): Neal Patel

343 *Gabriella Hays†*
Mentor(s): AJ Schwichtenberg; Amy Janis

344 *Hudson Hochstedler†*
Mentor(s): Harsha Honnappa; Zachary Selk

345 *Fan Jing Hoon†*
Mentor(s): Mark Johnson; Sarang Pramod

346 *Sophia Horn†*
Mentor(s): Maria Sepulveda; Tyler Hoskins; Meredith Scherer

347 *Chingyan Huang†*
Mentor(s): Chao Cai

348Ψ *Quinlan Huntzinger†; Daniella Ferrante**
Mentor(s): Spencer Headworth; David McElhattan

349 *Vivian Hurn†*
Mentor(s): Wei Zheng; Luqing Liu; Tianyuan Sang

350 *Blake Iftiger†; Conor McCarthy‡; Saichandana Pothireddy‡; Hongyi Shen‡; Justin Lesinski‡; Jacob Zendejas‡; Meghan Gron**
Mentor(s): Wenzhuo Wu; Nachiket Vatkar

351 *Lucas Johnson†*
Mentor(s): Kurt Ristroph; Luiza Olivera; Pablo Vega

352 *Jason Jong†; Niall Moloney†; Joey Pelletier†; Ian Laudo†; Jack Schwyn†; Daksh Negi†; Kevin Clapp†; Shri Eda†; Austin Lee†; Dylan McCool†*
Mentor(s): Brandon Dimitri; Brandon Dimitri

353 *Matthew Kaboolian†*
Mentor(s): Kendra Erk; Parth Kelkar; Seth Lindberg

354 *Joshua Kaluf†*
Mentor(s): Joe Ogas; Jiaxin Long

355 *Grace Katz†; Roy Galazka†; Zheng Yuan Tan†; Haoyu Shen†; Braden Garretson‡; Ethan Pinarski‡*
Mentor(s): Dan Milisavljevic

356Ω *Rida Khatri†*
Mentor(s): Alvin Kao; Nicholas Baumgartner; Kyoungmin Noh

357 *Kayla Kramer†*
Mentor(s): Aaron Thompson

358 *Erin Joy Kramer†; Maheep Brar†*
Mentor(s): Edward Delp

359 *Alexis Lautenschlaeger†*
Mentor(s): Elliot Friedman

360 *Briana Lavine†*
Mentor(s): Adrian Gentry

361 *Justin Lesinski†; Conor McCarthy‡; Meghan Gron‡; Jacob Zendejas‡; Hongyi Shen‡; Blake Iftiger‡; Saichandana Pothireddy‡*
Mentor(s): Wenzhuo Wu; Nachiket Vatkar

362Ω *Zachary Limaye†; Brian Magnuson**
Mentor(s): Nusrat Jung; Brandon Boor; Jordan Cross

363 *Xiaoyu Liu†; Lei Fu†*
Mentor(s): Jon Peterson; Julia Anne Garner

364 *Erica Long†*
Mentor(s): Tim Johnson; Eunice Centeno

365 *Alexis Lowe†*
Mentor(s): Caitlin Proctor; Madeline Larsen

366 *Samantha Maari†*
Mentor(s): Elliot Friedman

367 *Brian Magnuson†; Zachary Limaye**
Mentor(s): Brandon Boor; Nusrat Jung; Jordan Cross; Satya Patra

368 *Elise Malehorn†*
Mentor(s): Kameron Moding; Elizabeth Kielb

369 *Maximilian Manzhosov†; Brian Ng†; Timothy Nadolsky†; Haichang Li‡*
Mentor(s): Yung-Hsiang Lu; Purvish Jajal

370 *Joshua Mariani†; Alvin Cai†; Chase Weinstein†; David Kim†; Kate Veltri†; Mallory Motz†; Mallory Zobel†; Emily Andrews†; Emma Kane†; Emily Spicuzza†*
Mentor(s): Kari Clase; Harry Ashbaugh; Morgan Gyger; Zhujin Xia; Amanda Blankenberger

371 *Jackson Masten†; Faith Allen†*
Mentor(s): Anne Sereno; Daniel Larranaga

372 *Shresth Mathur†*
Mentor(s): Tiwei Wei; Shuhang Lyu

373 *Conor McCarthy†; Meghan Gron*; Blake Iftiger*; Justin Lesinski*; Jacob Zendejas*; Sai Pothireddy*; Hongyi Shen**
Mentor(s): Wenzhuo Wu; Nachiket Vatkar

374 *Gracie McGloin†; Sydney Bergeron†*
Mentor(s): Bridgette Kelleher; Veronika Vozka

375 *Andrew Modin†*
Mentor(s): Tiwei Wei; Aidan Powers

376 *Robert Murphy†; Jimmy Jin†; Pranav Jagada†*
Mentor(s): Cole Nelson; Mark Johnson; Sarang Pramod

377 *Tarun Nandamudi†*
Mentor(s): Craig Goergen; Conner Earl

378Ω *Jared Nathan†; Aditi Edlabadkar**
Mentor(s): David Warsinger; Andres Arrieta; Matt Boston; Mojtaba Zarei

379 *Noelle Naughton†*
Mentor(s): Mark Hall; Kedric Milholland

380 *Long Nguyen†; Tam Le†*
Mentor(s): Samuel Peana

381 *Owen Odney†; Shivam Raj†; John Burns†*
Mentor(s): Rafael Lang

382 *Kourtney Otte†; Bronwyn Rigsby†*
Mentor(s): Calah Ford

383 *Ingrid Owczarzak†*
Mentor(s): John Mulrow

384 *Laura Payne†*
Mentor(s): Val Watts; Tiffany Dwyer; Brenton Smith

385 *Jackson Pechin†*
Mentor(s): Sa Liu; Jung Hyun Lee; Alaina Bryant

386 *Stanislav Pelipad†*
Mentor(s): Lucas Cohen

387 *Jayden Pierce†*
Mentor(s): Yan-Shu Huang; Yan-Shu Huang

388 *Anastasia Pinopoulos†*
Mentor(s): Zoe Taylor; Yumary Ruiz

389 *Saichandana Pothireddy†; Meghan Gron‡; Blake Iftiger‡; Conor McCarthy‡; Jacob Zendejas‡; Justin Lesinski‡; Hongyi Shen‡*
Mentor(s): Wenzhuo Wu; Nachiket Vatkar

390 *Nitya Prabhakar†*
Mentor(s): Susan South; Samantha Dashineau

391Ω *Diya Prasanth†; Gustavo Franzener Goncalves da Silva†*
Mentor(s): Nan Kong; Baijian Yang

392Ω *Sarah Preston†; Rebecca Lewis*; Chloe Garrett*; Hannah Winstone*; Lucas Stouder*; Johnny Vanos**
Mentor(s): Chad Carroll; Nathan Campbell; Camila Reyes; Wayne Campbell; Anna Barker

393 *Mathias Pretet†; Trent Bloor‡*
Mentor(s): Peter Bermel; Allen Garner

394 *Amritanshu Ranjan†; Pranav Kolady†; Aaditya Pai†; Sanjeev Kummarapurugu†; Shashank Sridhar†; Archis Raykar†*
Mentor(s): Samuel Labi; Richard Ajagu; Shreya Ghosh

395 *Ishaan Rao†; Becca Reinecke†; Mark Kosmerl†; Sam Smith†; Ashwin Limaye†; Cristina Macias†; Sophie Witters†; Sathvik Srikanth†*
Mentor(s): Tony Cofer; Alina Alexeenko; Andrew Binder

396 *Ella Robinson†*
Mentor(s): Roli Wilhelm

397Ω *Natalia Rodriguez†*
Mentor(s): Jozef Kokini; Harrison Helmick

398 *Astrid Rodriguez Leon†*
Mentor(s): Karen Hudson; Militza Carrero-Colon

399 *Sajal Salim†*
Mentor(s): Mike Reppert; Jacob Wat

400 *Nikitha Sam†; Ryan Shepherd‡; Mayur Srinivas**
Mentor(s): David Warsinger

401 *Pritham Sambathur†*
Mentor(s): Bruce Applegate

402 *Katherine Sandys†; Joseph Lin†; Leng Lohanakakul†*
Mentor(s): Edward Delp; Carla Zoltowski

403 *Robert Sego†; Xilai Dai†; Alex Weber†; Patrick Li†; Sun Ahn†; Wenjing Chen†*
Mentor(s): Carla Zoltowski; Edward Delp

404 *Sathveka Sembian†; Alyssa Arreola†*
Mentor(s): Natalia Rodriguez; Lara Balian; Tiwalade Adekunle; Layla Claure

405 *Revanth Krishna Senthilkumaran†*
Mentor(s): Byung-Cheol Min; Shyam Sundar Kannan; Vishnunadan Venkatesh

406 *Jeff Shao†; Emily Tonkovich†; Jinkai Liu†; Ryan Ford†; Alexandria Montoya†; Anna Rosha†*
Mentor(s): Dionysios Aliprantis; Loraine Navarro; Dakota Hamilton

407 *Arden Shen†*
Mentor(s): Craig Goergen; Jennifer Anderson

408 *Emma Showalter†*
Mentor(s): Franki Kung

409 *William Shumway†*
Mentor(s): Erik Otarola-Castillo; Trevor Keevil

410 *Daksh Kumar Singh†*
Mentor(s): Alexandra Boltasseva; Blake Wilson; Yuheng Chen

411 *Gurmehar Singh†; David Bondar‡; Atharva Awasthi‡; Nathan Benton‡*
Mentor(s): Rafael Lang; Shengchao Li

412 *Colby Smock†*
Mentor(s): Aaron Thompson

413 *Evy Tobolski†*
Mentor(s): Theresa Casey; Radiah Minor; Allan Schinckel; Wonders Ogundare; Linda Beckett

414 *Lauren Todd†; Emily Staub†*
Mentor(s): M. Rosie Shrout; Emily M. Buehler; Daeun Grace Lee

415 *Austin Trebley†; Hannah Rodgers‡; Annabelle Hoffert‡; Lucas Bottini‡; Nicole Stepp‡; Mackenzi Rivera‡*
Mentor(s): Keith Stantz

416 *Claire Tulloch†*
Mentor(s): Christina Wilson-Frank

417 *Anjali Vanamala†*
Mentor(s): Sanjay Rao; Chandan Bothra

418 *Cayla Woten†*
Mentor(s): David Purpura; Lauren Westerberg; Lindsey Bryant; Sara A. Schmitt; Robert J. Duncan

419 *Troy Wu†; Yi-Fang Hsiung‡*
Mentor(s): Mark Johnson Johnson

420 *Zilin Xianyu†*
Mentor(s): Zahra Tehrani

421 *Daniel Xie†*
Mentor(s): Hemanta Maji; Jimmy Hwang; Xiuyu Ye

422 *Jacob Zendejas†; Conor McCarthy‡; Meghan Gron‡; Saichandana Pothireddy‡; Hongyi Shen‡; Justin Lesinski‡; Blake Iftiger‡*
Mentor(s): Wenzhuo Wu

423 *Jason Zuniga†*
Mentor(s): Krishna Jayant; Daniel Gonzales

THIRD POSTER SESSION | 2:00PM-3:30PM

500 *Mayank Agarwal†; Qiancheng Sun‡*
Mentor(s): Tillmann Kubis

501 *Alyssa Altman†*
Mentor(s): Zahra Tehrani

502 *Sai Ambaty†*
Mentor(s): Luiz Brito; Jay Johnson; MaryKate Byrd; Andre Araujo

503 *Faith Anthony†*
Mentor(s): Bridgette Kelleher

504 *Anushree Ari†; Ethan Forbes*; Sandra Warne*; Elisabeth Kohl**
Mentor(s): Ben Watson; Seema Mattoo

505 *Brianna Arinze†*
Mentor(s): Chris Rochet; Jennifer Hensel; Benjamin Dehay; Erwan Bezard; Jason Cannon

506 *Tremael Arrington†*
Mentor(s): Carol Handwerker; Yifan Wu

507Ω *Aytaj Aslanli†; Muhammad Rifqi Priatama Sambodo‡*
Mentor(s): Behzad Esmaeili; Hyewon Seo

508 *Fritz Aude†; Holly Ryan†; Tereas Wan†; Ryken Adams-Barnes†*
Mentor(s): Husheng Guan

509 *Madison Balgeman†; Amber Carpenter*; Kyle Chang*; Kaitlin Zeltwanger**
Mentor(s): Aaron Lottes; Andrew Brightman

510 *Ron Bejerano†*
Mentor(s): Gang Shao

511 *Kara Benbow†*
Mentor(s): Jozef Kokini; Harrison Helmick

512 *Michael Bezick†*
Mentor(s): Alexandra Boltasseva; Blake Wilson

513 *Jenna Boha†*
Mentor(s): Candace Croney; Aynsley Romaniuk; Shanis Barnard

514 *Sean Brown†*
Mentor(s): Daniel Raudabaugh; Samira Fatemi

515 *Brynna Buckmaster†; Sean Giltmier†; Aidan Hartung†; Ian Heinig†; Kya Pierson†*
Mentor(s): Kristen Bellisario

516 *Lorenzo Cacciapuoti†*
Mentor(s): Mark Johnson

517 *Raul Castro†*
Mentor(s): Chris Rochet; Sehong Min

518 *Isabel Cava†; Megan Morley†; Elizabeth Salwitz‡*
Mentor(s): Andrea DeMaria; Risa Cromer; Fatimah Lawal

519 *Madelyn Chadwick†; Saaniya Rupani†*
Mentor(s): Luis Solorio; Claudia Benito Alston

520 *Madison Charnigo†*
Mentor(s): Arezoo Ardekani; Gaurav Kumar

521 *Meredith Chasse†; Grace Gochnauer‡*
Mentor(s): Jill Newton

522 *Liying Che†*
Mentor(s): Kristine Marceau; Amy Loviska; Sohee Lee; Michelle Rogers; Kristina Jackson

523 *Evan Chen†; Paloma Arellano†; Hyoju Kang†; Shao Ning Huang†; Ryan Davitt†; Atharva Thakur†*
Mentor(s): Shreya Ghosh

524 *Annabella Chen†*
Mentor(s): Henry Chang

525 *Nicholas Christ†*
Mentor(s): Chelsea Davis; Tyler Roberts

526 *Chloe Chui†*
Mentor(s): Xing Liu; Kankan Wang; Lihong Li

527 *Olivia Clegg†*
Mentor(s): Zahra Tehrani

528 *Thomas Coleman†; Isha Nair†; Katie Chan†; Matthew Trotter†; Karla Dominguez Omaña†; Alana Hernandez†; Frank LoRusso†*
Mentor(s): Kari Clase; Adam Quinn; Daphne Fauber; Anjana Narayanan; Arya Shembekar

529 *Mackenzie Crum†*
Mentor(s): Jon Rienstra-Kiracofe

530 *Cody Dateno†*
Mentor(s): Stuart Carlton

531 *Corrin Davis†; Elizabeth (Ellie) Fisher‡*
Mentor(s): Theresa Casey; Allan Schinckel; Wonders Ogundare

532 *Anthony DeSanto†; Melanie Clayton†*
Mentor(s): AJ Schwichtenberg; Amy Janis; Maggie O'Haire

533 *Avi Dube†*
Mentor(s): Shreyas Sundaram; Tong Yao

534 *Alex Dudley†*
Mentor(s): Patrick Zollner; Marian Wahl; Grant Burcham; Lee Humberg; Bryan Kluever

535 *Lekha Durai†*
Mentor(s): Nan Kong

536 *Michael Foster†; Khoi Pham‡*
Mentor(s): Mark Johnson; Cole Nelson

537 *Julia Gabennesch†; Erik Zabalegui Lopez**
Mentor(s): Alina Alexeenko; Petr Sergeyevich Kazarin; Evgeniia Vorozhbit

538 *Brianna Gast†; Evy Tobolski*; Lauren Jones**
Mentor(s): Theresa Casey; Linda Beckett; Kyrstin Gouveia; Jacquelyn Boerman

539 *Maya Godbole†*
Mentor(s): Hyowon Lee; James Nolan

540 *Sean Greenley†*
Mentor(s): Cole Nelson; Mark Johnson

541 *Kelly Haddow†*
Mentor(s): Yumary Ruiz; Kaitlin Brown-Krapf

542 *Abby Hagan†*
Mentor(s): Qian Wang

543 *Sophia Hagedorn†; Emily Deldar†; Mackenzie Greulach†*
Mentor(s): Françoise Brosseau-Lapré; Itzel Matamoros

544 *Francesca Hamacher†*
Mentor(s): Jackie Linnes; Luke Brennan; Natalia Rodriguez

545 *Richard Hambleton†; Cristopher Pulaski‡*
Mentor(s): Shreya Ghosh

546Ω *Alison Hannon†*
Mentor(s): Rick Mattes; Heather Eicher-Miller; Anita Panjwani

547 *Kayla Huter†; Anna McCoy†*
Mentor(s): Lauren Stoczynski; Stephanie Gardner

548 *Jinho Hwang†*
Mentor(s): Qian Wang

549 *Emma Jacobs†; Emily Abernathy‡; Siana Fox‡; Nadia Brooks‡; Eunice Barron-Ribas‡; Ariel Hart‡; Karah Lee‡; Philip Patchan‡; Anna Lopez‡*
Mentor(s): Inna Abramova

550 *Kyochul Jang†*
Mentor(s): Kyu Kang

551 *Pravin Jayatissa†*
Mentor(s): Luis Gomez; Nahian Hasan

552 *Jacob Jenkins†; Jordan Potter†; Emma Jones‡; Lydia Zhang‡*
Mentor(s): Jennifer Smith; Jasmine Begeske

553 *Navjot Kaur†*
Mentor(s): Matthew Olson

554 *Shriya Khandelwal†*
Mentor(s): Rakesh Agrawal; Apurva Pradhan

555 *Gaeun Kim†; Tongwei Zhang‡*
Mentor(s): Denny Yu

556 *Soomin Kim†*
Mentor(s): Byung-Cheol Min; Go-eum Cha

557Ψ *Jack Kirkwood†; Addy Messerly‡*
Mentor(s): Ximena Bernal; Andrew Mularo

558 *Erik Kocinare†; Alexiy Buynitsky‡*
Mentor(s): James Davis

559 *Zachary Lagpacan†; Guillaume Hu†; Om Gupta†; Ansh Patel†*
Mentor(s): Mark Johnson; Tim Rogers; Manikanta Tiruveedula; Raghul Prakash

560 *Max Lantz†*
Mentor(s): Jesus Meza-Galvan; Steven Pugia; Anthony Cofer; Alina Alexeenko

561 *Andy Le†; Will Oberly†; Elliot Wong†; Katie Kneeland†; Andrew Modin†; Becca Reinecke**
Mentor(s): Tony Cofer; Alina Alexeenko; Andrew Binder

562Ω *Rebecca Lewis†; Sarah Preston‡; Chloe Garrett‡; Hannah Winstone‡; John Vanos‡; Lucas Stouder‡*
Mentor(s): Chad Carroll; Wayne Campbell

563 *Chi-Wei Lien†; Natsu Yamamoto†*
Mentor(s): Sudip Vhaduri

564 *Nathaniel Lindsay†; Gaurangi Yadav*; Adriana Torres**
Mentor(s): Jeffrey Lucas; Rebecca Trapp

565Ω *Kathryn Malerbi†*
Mentor(s): Robbee Wedow

566 *Aubrey Mann†*
Mentor(s): Amanda Veile; Meredith Aulds

567 *Kendall Massey†; Race Medema†; Bailey Williams†; William Petrusson†; Violeta Saldarriaga†; Patricia Casaca†*
Mentor(s): Kari Clase; Aaron Quinn; Daphne Fauber; Anjana Narayannan; Arya Shembeckar

568 *Kiernan McCormickk†*
Mentor(s): Aaron Specht

569 *Kate McNulty†*
Mentor(s): Tzu-Wen Cross; Abigayle Simpson; Anna Clapp Organski

570 *Emma Miller†; Matthew Graber‡*
Mentor(s): Robin Tanamachi

571 *Valerie Minnick†; Ted Tobias**
Mentor(s): Jon Rienstra-Kiracofe

572Ψ *Marco A. Monrouzeau†*
Mentor(s): Robin Tanamachi

573 *Kyle Morin†*
Mentor(s): Mike Sori

574 *Jackson Moss†*
Mentor(s): Zahra Tehrani

575 *Yukina Murata†*
Mentor(s): Jozef Kokini; Anh Minh Le

576 *Minh Nguyen†; Rauf Erkiletlioglu‡; Vijay Tummalapenta‡*
Mentor(s): Mark Johnson

577 *Chinelo Nnatubeugo†; Claire Kinder*; Lily Snyder*; Faith McPhee**
Mentor(s): William Graziano; Regina Henares

578 *Aidan Ocken†*
Mentor(s): Zahra Tehrani

579Ω *Carli O'Keefe†; Sydney Vallier†*
Mentor(s): Kristen Bellisario; Bryan Pijanowski

580 *Ronald Or†*
Mentor(s): Erin Hennes; Taeik Kim

581Ω *Emily Otten†*
Mentor(s): Andrea DeMaria; Rebecca Martinez; Natalia Rodriguez; Risa Cromer; Yumary Ruiz

582 *Rhea Pahuja†; João Pedro Bacchi†; William Davis†; Siya Deshpande†; Trent Fatur†; Emma Fisk†; Thomas Greer†; Justin Lin†; Owen Lindner†; Ian Veak†*
Mentor(s): Tony Cofer; Alina Alexeenko; Andrew Binder

583 *Isabel Panicker†*
Mentor(s): Rakesh Agrawal; Jonathan Turnley

584 *Karina Paone†*
Mentor(s): Shih-Chun Kao

585 *Krishna Patel†; Payne Turney‡*
Mentor(s): Scott Briggs; Smriti Hoda

586 *Kaylee Patterson†; Brianna Coster‡; Helen Willis‡; Isabel Pati‡*
Mentor(s): Jessica Huber; Sandy Snyder

587 *Viet Khoi Pham Khac†*
Mentor(s): Andrew Wildridge; Andreas Jung

588 *Ashley Phoenix†; Austin Lu**
Mentor(s): Nicholas Noinaj

589 *Kotekar Annapoorna Prabhu†; Caroline Henson**
Mentor(s): Alexandria Volkening

590 *Amit Rohan Rajapurohita†*
Mentor(s): Arnab Banerjee

591 *Prudence Regacho†*
Mentor(s): Kristine Marceau

592 *Kathleen Reyna†*
Mentor(s): Kristen Bellisario

593 *Claire Richert†; Nicole Milharcic†*
Mentor(s): Françoise Brosseau-Lapré

594 *Kenneth Rodriguez-Lopez†; Tanvi Breinig**
Mentor(s): Shalini Low-Nam; Kevin Scrudders

595 *Saaniya Rupani†*
Mentor(s): Zahra Tehrani

596Ω *Nemisa Samanthapudi†*
Mentor(s): Tho Le

597 *Abhiram Saridena†*
Mentor(s): Craig Goergen; Conner Earl

598 *Diana Marie Sarrico†*
Mentor(s): Zahra Tehrani

599 *Nandhitaa Satyanarayanan†*
Mentor(s): Stephanie Gardner; Anupriya Karippadath

600 *Jenna Schoonmaker†*
Mentor(s): Theresa Casey; Kelsey Teeple; Prabha Rajput

601Ω *Sathveka Sembian†; Olivia Carlson†*
Mentor(s): Andrea DeMaria; Katherine Head; Trexie Rudd; Monica Kasting

602 *Neha Shah†*
Mentor(s): Xing Liu

603 *Anurag Shah†; Ziyang Huang*; Tzu-wen Hsu*; Alex Liu*; Bai Li*; Yohan Berg*; Eli Coltin**
Mentor(s): Gustavo Rodriguez-Rivera

604 *Emma Shelton†; Corrin Davis**
Mentor(s): Theresa Casey; KaLynn Harlow; Linda Beckett

605 *Siddhi Shetty†*
Mentor(s): Angeline Lyon; Ketaki Mahurkar

606 *Mae Shu†; Emma Terwilliger*; Lauren Gartenhaus**
Mentor(s): Jason Hanna; Annaleigh Powell

607 *Rachel Siela†; Laurel Williams†; Kaylee Bobay†; Conghao Gao†; Deeksha Handa†; Madison Chin†; Athena Fordwor‡; Victoria Tuell‡; Grace Strabala‡; Erin Lee*; Olivia Battaglia*; Tiernan McDivitt*; Alyssa Cregg**
Mentor(s): Amanda Seidl; Bridgette Kelleher; Erica Hill; Laraib Kausar

608 *Julia Simler†; Garret Manquen†*
Mentor(s): Kari Clase

609 *Shelby Sliger†*
Mentor(s): Joe Ogas; Jiaxin Long

610 *Pedro Daniel Soto Rodriguez†; Cameron Hartsfield†*
Mentor(s): Eduardo Barocio; Andreas Jung

611 *Pranav Srisankar†; Duncan Van†; Jason Choi†; Wilson Wong†*
Mentor(s): Mark Johnson; Sarang Pramod

612 *Aavya Srivastava†*
Mentor(s): Deva Chan; Cameron Villarreal

613 *Alexis Starkey†; Ben Hausch†; Tejas Patel†; Audrey Quinn‡; Keely Dehn‡; Keaton Schroder‡; Josh Renzi‡; Charles Degnan‡*
Mentor(s): Kristen Bellisario

614Ω *Alicia Stevance†*
Mentor(s): Bethany McGowan

615 *William Stevens†; Xingyan (Ian) Li†; Mykhailo (Misha) Tsysin†*
Mentor(s): Edward Delp; Carla Zoltowski

616 *Kaitlin Stone†; Galit Beraja†; Harris Collins†*
Mentor(s): Jason Ware

617 *Madeleine Strom†*
Mentor(s): Aaron Bowman; Anke Tukker

618 *Alina Stuleanu†; Wyatt Gay*; Hannah Gagelin*; Aidan Crowley**
Mentor(s): Amy Marconnet; Pranay Nagrani; Ritwik Kulkarni

619 *Shannon Sturt†*
Mentor(s): Teri Kirby

620 *Qiancheng Sun†*
Mentor(s): Tillmann Kubis

621 *Jenna Swihart†*
Mentor(s): Jennifer Freeman; Sydney Stradtman

622 *Jillian Szweda†*
Mentor(s): Kristine Marceau; Amy Loviska; Kristina Jackson; Michelle Rogers

623Ω *Anthony Tan†*
Mentor(s): Kristen Bellisario

624 *Vijay Tummalapenta†*
Mentor(s): Mark Johnson; Rauf Erkiletlioglu

625 *MacKenzie Ulrey†; Anne Taylor‡*
Mentor(s): Greg Fraley; Jeff Lucas; Jenna Schober; Melanie Bergman

626 *Giulia Virga†; Emily Wood†; Sophie Minakata†*
Mentor(s): Françoise Brosseau-Lapré

627 *Andrew Walke†*
Mentor(s): Shalini Low-Nam; Jean Chmielewski; Kevin Scrudders; Vinny Menon; Thomas Dietsche

628 *Hannah Walls†*
Mentor(s): Darrin Karcher; Brittney Emmert

629 *Beining Wang†; Cooper Sims†; Zaccary Anderson†; Adyan Khan†; Molly Geiger†; Kayla Scott†; Miriam Walker†; Emma Newton†*
Mentor(s): Kari Clase; Aaron Gin; Jason Lee; Quintin Walter; Rhutuja Patil

630 *Ruth Wei†; Gavin Duffy**
Mentor(s): Caitlin Proctor; Aliya Ehde

631 *Xander Weintraut†*
Mentor(s): Zahra Tehrani

632 *Hannah Winstone†*
Mentor(s): Chad Carroll; Nathan Campbell; Anna Barker

633 *Joseph Woo†*
Mentor(s): James Davis; Purvish Jajal

634 *Kayla Wrobleski†*
Mentor(s): Richard Kuhn; Jacqueline Anderson

635 *Addison Young†*
Mentor(s): Sujith Puthiyaveetil; Steven McKenzie

636 *Peter Zakariya†; Samskrithi Sivakumar†; Michael Cheng†; Anika Mathur†; Tanishka Kulkarni‡*
Mentor(s): Timothy Keaton

637 *Gracie Turner†*
Mentor(s): Amanda Veile

638 *Anders Johnson†*
Mentor(s): Linda Nie; Alexis Webb

RESEARCH TALKS

SESSION 1: 9:00AM-10:00AM

ROOM: STEW 214A

9:00 Managing Nurse Cognitive Load in Emergency Patient Care Situations with the use of Decision-Making Aids
700 *Clare Goodman†*
Mentor(s): Denny Yu; Nick Anton

9:20 VF PLUME: Vertical Farm Plant Localizing UAV with Mass Estimation
701 *Alexander Hanna†; Weicheng Lee†; Craig Cheung†*
Mentor(s): James Goppert; Krishna Nemali

9:40 Visualizing Stress Fields in Composites Using Mechanophores
702 *Tristan Wiley†*
Mentor(s): Chelsea Davis; Jared Gohl; Nazmul Haque

ROOM: STEW 214B

9:00 Detecting Age-Related Changes in Gait Using Inertial Measurement Units
703 *Elsa Davis†; Mithran Periassamy†; Guilherme Basso*; Hala Haddad*; Amanda Martin*; Braden Stock*; Morgan Rinkema**
Mentor(s): Jeffrey Haddad

9:20 Chlorpyrifos and chlorpyrifos-oxon exposures lead to the dysregulation of basal glutamate release in human-induced pluripotent stem cell-derived glutamatergic neuron
704Ω *Adam Barmash Rubinchik†*
Mentor(s): Aaron Bowman; Anke Tukker

9:40 Explaining the Interaction of Perceived Health, Chronic Conditions, and Mortality: Role of Allostatic Load
705Ω *Lauren Voss†*
Mentor(s): Elliot Friedman

ROOM: STEW 214C

9:00 CFD Modeling of Liquid Injection in a Rotating Detonation Combustor
706 *Alexander Suppiah†*
Mentor(s): James Braun; Guillermo Paniagua

9:20 Drivers of the Local Distribution of Avian Cholera in California
707Ω *Dylan Clarke†*
Mentor(s): Wendy Beauvais; Eric Kontowicz

9:40 Automated Crater Morphology Characterization on the Moon Using an Unsupervised Neural Network
708 *Sara Cuevas-Quiñones†*
Mentor(s): Ali Bramson; Lior Rubanenko

ROOM: STEW 214D

9:40 The Plant Data Service: Developing An Ontologically-Consistent Approach to Sharing Functional Data
709 *Autumn Denny†*
Mentor(s): Ankita Raturi; Juliet Norton; Steven Doyle

SESSION 2: 10:00AM-11:00AM

ROOM: STEW 214A

10:00 Entanglement Distribution on a Photonic Integrated Circuit
710 *Gabriel Alminauskas†; Collin Campbell†; Runlin Wang†*
Mentor(s): Lucas Cohen; Andrew Weiner

10:20 Functional Connectome Identifiability through Tensor Decomposition
711 *Vitor Farias Costa de Carvalho†*
Mentor(s): Ana Estrada Gomez; Joaquín Goñi Cortes; Mintao Liu

10:40 An Origami-Inspired Deployable Space Debris Collector
712 *Yuto Tanaka†; Aditya Arjun Anibha†*
Mentor(s): Ran Dai

ROOM: STEW 214B

10:00 Active Herbicide ingredients in Roundup Ready Xtend products, glyphosate and dicamba, results in hypoactivity in zebrafish larvae when exposed during development
713 *Ryker Bond†*
Mentor(s): Jennifer Freeman; Vasisht Varsh Sridhar; Ola Wasel

10:20 Retrosplenial cortical mechanisms contributions to acquisition of inhibitory avoidance
714 *Michael Kuczajda†*
Mentor(s): Sydney Trask; Erisa Met-Hoxa

ROOM: STEW 214C

10:00 Improving Forecasts of U.S. Elections
716 *Ryan Branstetter†*
Mentor(s): Alexandria Volkening

10:20 Determining the oncogenic potential of PP2A-B56a in PDAC
717 *Sydney J. Clifford†*
Mentor(s): Brittany Allen-Petersen; Claire M. Pfeffer; Jennifer P. Morton; Jukka Westermarck

10:40 Analytic Spatial Resolution of the Dark Matter Detecting Windchime Array
718 *Bahaa Elshimy†*
Mentor(s): Rafael Lang; Juehang Qin

ROOM: STEW 214D

10:00 Top Quark Entanglement
719 *Nicholas Erikson†; Titus Tse†; Aiden Cullen†*
Mentor(s): Andy Jung

10:20 Synthetic Data Generation for RoboMaster Amor Plate Detection
720 *Xipeng Wang†; Mengting Xu†; Guo Yu†*
Mentor(s): Abolfazl Hashemi; Minghao Sun

10:40 Evaluating the efficacy of IPM strategies against insect pests of collards
721 *Elliott Masterson†; Layton Rosen**
Mentor(s): Elizabeth Long

SESSION 3: 11:00AM-12:00PM

ROOM: STEW 214A

11:00 The Impact Of Lactation on Pregnancy-Induced Cardiac Hypertrophy During Postpartum in Mice
722 *Kyndall Davis†; Arden Shen‡; Charlotte Cleary‡; Gracine Sime‡*
Mentor(s): Craig Goergen; Kyoko Yoshida; Jennifer Anderson

11:20 Tape Peel Adhesion on Soft Substrates
723 *Rebecca Jennings†*
Mentor(s): Chelsea Davis; Jared Gohl; William Zummo; Adrian Defante

11:40 How strong are Low Temperature Solders (LTS) in Microelectronics?
724 *Surya Perla†*
Mentor(s): Ganesh Subbarayan; Sukshitha Puttur Lakshminarayana; Sean Lai

ROOM: STEW 214B

11:00 Child Automated Speech to TExt
725 *Anish Bhowmik†; Daniel Zheng†; Aadya Pawar†; Jasper Koliba‡; Reagan Becker‡; Aarini Panzade‡; Brian Ha‡; Aarohi Panzade‡; Aakanksha Shripal‡*
Mentor(s): David Purpura; Avery Closser

11:20 Role Differentiated Bimanual Manipulations During Naturalistic Infant Play in the Home
726 *Tatum Neal†; Ashley Hartman†; Jenna Chesterman†*
Mentor(s): Laura Claxton; Paige Thompson

11:40 Patient, family, and provider experiences with advance care planning in Parkinson’s
727 *Aubrey Parr†*
Mentor(s): Jiayun Xu

ROOM: STEW 214C

11:00 Maternal education and child sleep problems: Are they associated in families raising children with autism?
728 *Miriam Rimawi†*
Mentor(s): AJ Schwichtenberg; Emily Abel

11:20 Identifying Health Equity Language in Pharmacy Residency Programs through Analysis of Promotional Content
729 *Sarah Vas†; Jessica Schowe‡; Jasmine Reyes*; Taylor (Kenedie) Krout**
Mentor(s): Monica Miller; Rakhi Karwa

ROOM: STEW 214D

11:00 Effects of Gut Microbiome on Spontaneous Osteoarthritis
731 *Anisha Rath†; Noah Jasinkiewicsz‡; Jenna Brual‡*
Mentor(s): Deva Chan; Cameron Villarreal; Zachary Davis

11:20 Post Pandemic Hybrid Work: Research and Application
732 *Joshua Reilly-Grim†*
Mentor(s): Lindsay Rosokha; Olga Senicheva

11:40 Business Employer Perspectives on New Hires' Information Literacy Needs in the Workplace
733 *Jiahong Wang†*
Mentor(s): Heather Howard; Margaret Phillips

SESSION 4: 12:00M-1:00PM

ROOM: STEW 214A

12:00
734
Perceptions of Artificial Intelligence in Higher Education: A Case Study of Purdue University Liberal Arts Professors
Jack Blair†; Jing Gao†; Kian Kishimoto†
Mentor(s): Heidi Fahning; Mae Artang

12:20
735
Monon Neighborhood Livability Study
Abby Dimmick†
Mentor(s): Jason Ware

12:40
736
“Students in Action”: College Students’ Experiences in Facilitating Middle and High School Students’ Community Projects
Haley Zeri†; Nikhil Gloyeske†; Ethan Guardado†; Ian Heinig‡; Daniel Hiller‡; Michael Reisinger‡; Harris Collins‡
Mentor(s): Jason Ware

ROOM: STEW 214B

12:00
737
Neuroimaging Approaches to Identifying PFAS-Induced Increased Risk for Psychosis
William Mahoney†
Mentor(s): Uzay Emir; Jason Cannon; Dan Foti

12:20
738
Advance Care Planning Across Adulthood
Rachel Mendez†
Mentor(s): Jessica Huber

12:40
739
Can feeding a bifido bacteria that readily digests lactose and galactooligosacharides improve lactose digestion and tolerance through alteration of the microbiome?
Olivia Moreno†
Mentor(s): Dennis Savaiano; Tzu-Wen Cross; Tracy Eaton

ROOM: STEW 214C

12:00
740
Changes in daily patterns of physiological measures of heat stress on sows in cool room and in heated room with and without a cooling pad.
Jemima Baributsa†
Mentor(s): Allan Schinckel; Robert Stwalley

12:20
741
Comparative analysis of Enterotoxigenic Escherichia coli F4 and F18 strains adhesion on porcine intestinal epithelial cell line IPEC-J2
Chenhai Li†
Mentor(s): Arun Bhunia; Dongqi Liu; Nathan Horn

12:40
742
Examing Peer and Self-Assessment of Engagement in a Group Case-based Learning Scenario in an Introductory Animal Agricultural Course
Jessica Proctor†
Mentor(s): Elizabeth Karcher; Elizabeth Ragland; Brianna Wardwell

ROOM: STEW 214D

12:00
743
Exploring the Electrophysiological properties of Cortical Spheroids Carrying an Epilepsy-Linked SCN2A Mutation
Muhan Wang†; Hope Harlow‡; Conrad Otterbacher‡
Mentor(s): Yang Yang

12:20
744
Gas Phase Studies of Symmetric Viologen-Based Host-Guest Complexes
Danny Hristov†
Mentor(s): Julia Laskin; Hugo Samayoa-Oviedo

12:40
745
Fluo-4 Calcium Imaging of human-induced pluripotent stem cell-derived cortical neurons carrying a Voltage-Gated Sodium Channel Nav1.2-L1342P Genetic Variant
C. Max Otterbacher†; Muhan Wang‡
Mentor(s): Yang Yang; Maria Olivero-Acosta; Zhefu Que

SESSION 5: 1:00PM-2:00PM

ROOM: STEW 214A

1:00 Enhancing Structural Performance of Recycled Fiber-Reinforced Thermoplastic Composite Part Using Recycled Composite Laminate Cutouts
746 *FNU Archie†; Minjing Zhao‡*
Mentor(s): Garam Kim; Eduardo Barocio

1:20 Maximizing Efficiency in Biowall Design: watering system
747 *Siqi He†*
Mentor(s): Bill Hutzel; Dhanurja De Silva

1:40 Influence of Waterjet Cut Quality for Fabrication of Test Specimen on Mechanical Testing Results
748 *Jacob Montrose†*
Mentor(s): Garam Kim

ROOM: STEW 214B

1:00 Machine Learning in Motion
749Ω *Aiden Goen†; Seojeong Park†; Tri Than†; Bhavya Patel†; Arunima Chowdhury†; Herbert Alexander De Bruyn†*
Mentor(s): Renee Murray; Davin Huston

1:20 Effects of mushroom types and amounts on postprandial plasma glucose, insulin, and triglyceride responses in middle-aged and older adults: a titration experiment
750 *Jacqueline Schmok†*
Mentor(s): Wayne Campbell; Cassi Uffelman

1:40 Child Automated Speech-To-Text Project (CAST) : HMMs for Speech Recognition
751 *Aakanksha Shripal†; Aarini Panzade†; Brian Ha†*
Mentor(s): David Purpura; Avery Closser

ROOM: STEW 214C

1:00 Impact of Interest on Student Performance
752 *Taylor Moore†*
Mentor(s): Elizabeth Karcher; Elizabeth Ragland; Brianna Wardwell

1:20 Undergraduate Researchers in the Purdue War Effort, 1942-1946
753Ψ *Mikayla Klemp†*
Mentor(s): Adriana Harmeyer; Amy Childress

1:40 Neural Recorder Amplifier
754 *Azza Sumait†; Marissa Davide†*
Mentor(s): John Peterson; Saeed Mohammadi

ROOM: STEW 214D

1:00 Implications of a novel Fic protein from Bordetella sp. on Whooping Cough
755 *Rohan Aryan†; Rahul Saproo†*
Mentor(s): Seema Mattoo

1:20 A Genomic Analysis of the Global House Dust Mite Allergen Diversity
756 *Sarah Bennett†*
Mentor(s): Qixin He; Pavel Klimov

1:40 Role of receptor expression level in engineered T cell therapy efficacy
757 *Tanvi Breinig†; Kenneth Rodriguez-Lopez‡*
Mentor(s): Shalini Low-Nam; Kevin Scrudders

SESSION 6: 2:00PM-3:00PM

ROOM: STEW 214A

2:00 Elementary Students' Definitions of Failure: A Developmental Approach
758 *Alicia Drewes†; Jordan Fulk†*
Mentor(s): Calah Ford

2:20 Fathers of Children with Autism: Perceptions of Provider Supports
759 *Andrew Geguzys†; LeAnn Zhang‡*
Mentor(s): Rose Mason; Eric Shannon; Ban Sleiman Haidar; Hedda Meadan-Kaplansky

2:40 Cultural border crossing in rural communities: A narrative exploration in teaching middle school science
760 *Reagan Howard†*
Mentor(s): Selcen Guzey; Khanh Tran

ROOM: STEW 214B

2:00 Children's Distress During COVID-19 and its Relation with Vocabulary Development at 18 Months
761 *Kathleen Cory†; Vivian Lee†*
Mentor(s): Arielle Borovsky; Claney Outzen

2:20 Deep Learning for Child Speech Recognition
762 *Jasper Koliba†; Reagan Becker†; Aarohi Panzade†*
Mentor(s): David Purpura; Avery Closser

2:40 Improving Overall Quality of Life for Uterine Fibroid Patients Living in Indiana
763Ω *Sophie Shank†; Grace Khamis†; Isha Nair*; Cameron Kelly**
Mentor(s): Andrea DeMaria; Monica Kasting; Alfu Laily

ROOM: STEW 214C

2:00 Artificial Intelligence influences the artists
764 *Rongbo Hu†; Yutong Zhen‡*
Mentor(s): David Peterson

2:40 Effect of Recycled Concrete Aggregate on the CO2 capture and bio-receptivity of cementitious composites: A
766Ω new path to create net sub-zero carbon footprint materials
Yaw Yeboah†
Mentor(s): Mirian Velay-Lizancos; Husam Elgaali; Marina Garcia Lopez-Arias

ROOM: STEW 214D

2:00 Control My News Feed: Exploring How End Users Interact with and Manipulate Social Media
767 Recommendation Systems
Harmya Bhatt†
Mentor(s): Tianyi Li

2:20 Understanding the connection of KRAS activation and CIP2A expression in initiating PDAC events
768 *Ella Rose Chianis†*
Mentor(s): Brittany Allen-Petersen; Samantha Tinsley; Gagan Mall

2:40 The Implementation of a Universal, Single-Payer Healthcare System in the United States
769 *Samuel Hammons†*
Mentor(s): Fiona Wang

SESSION 7: 3:00PM-4:00PM

ROOM: STEW 214A

3:00 Creating Robust Artificial Intelligence Models for Medical Imaging
770 *Aditi Anand†*
Mentor(s): Kaushik Roy; Sarada Krithivasan

3:20 Humidity: A Key Factor in the Properties of Recycled Textile Reinforced Mortars
771 *Aniya Edwards†*
Mentor(s): Mirian Velay-Lizancos; Marina Garcia Lopez-Arias; Vito Francioso; Husam Elgaali

Review of gaps in reporting rigor of methods used for destabilization of the medial meniscus in mice
3:40 *Tyler Williams†*
772 Mentor(s): Dianne Little

ROOM: STEW 214B

3:00 Time course changes of mTOR signaling pathway in differentiated SH-SY5Y cells
773 *Priyanka Ranga†*
Mentor(s): Aaron Bowman; Xueqi Tang

3:20 **774**
Characterizing Strain Effects of Myocardial Infarction and Cardiac Patches Using 4-Dimensional Ultrasound
Samuel Zhang†
Mentor(s): Craig Goergen

3:40 **775**
The Role of Methylation in Regulating the Cellular Stress Response of Hsp31
James Rooney†; Jacob Lindsey‡
Mentor(s): Tony Hazbun

ROOM: STEW 214C

3:00 **776**
Maiming Misinformation: Why Understanding Bias is Paramount to Democracy
Stephanie Perun†
Mentor(s): Bethany McGowan

3:20 **777Ψ**
American Foreign Policy and Public Opinion of the Crimean War (1853-1856)
Anurag Shah†
Mentor(s): Michael Smith; Jonathan Lande

3:40 **778Ψ**
Women in the Early UN
Amelia Simpson†; Erika Wheeler‡
Mentor(s): Jennifer Foray

ROOM: STEW 214D

3:00 **779Ω**
Comparing the Freezing Properties of Different Lunar Simulant Particles of the Ancient Moon
Mariana Aguilar†; Valeria Garcia; Katherine Meves**
Mentor(s): Alexandria Johnson

3:20 **780**
Determining the Strength of the Annular Modes in a Barotropic Atmosphere
Dean Calhoun†
Mentor(s): Lei Wang

3:40 **781**
Tolerance and avoidance responses to novel saline conditions in an invasive treefrog
Addy Messerly†
Mentor(s): Ximena Bernal; Andrew Mularo; Ana Longo

SESSION 8: 4:00PM-5:00PM

ROOM: STEW 214A

4:00 **782**
Assessment of Vehicular Vision Obstruction Due to Driver’s Side B-Pillar and Remediation with Blind Spot Eliminator
Dilara Baysal†
Mentor(s): James Gibert

4:20 **783**
Correlating the Relaxation Times of T1rho and T2 MRI sequences to Osteoarthritis Outerbridge Scores for Human Humeral Head and Glenoid Articular Cartilage Characterization
Andrew Ferrer†
Mentor(s): Dianne Little; Kentaro Umemori; Deva Chan; Gregory Tamer

4:40 **784**
Manufacturing and Spatial Mapping of 2-Dimensional Array of Soft Capacitive Force Sensors with Carbon-Fiber Mesh and Silicone
Harry Lee†
Mentor(s): Garam Kim; Eduardo Barocio

ROOM: STEW 214B

4:00 **785**
Engineering challenges in re-implementations of the MaskFormer models in TensorFlow
Pongpatapee Peerapatanapokin†; Ibrahim Saeed†; Ananya Singh†
Mentor(s): James Davis; Vishal Purohit; Wenxin Jiang

4:20 **786**
Transcranial Magnetic Stimulation Coil Optimization
Kevin Zhang†
Mentor(s): Luis Gomez

ROOM: STEW 214C

4:00 **787**
A Computational Analysis on Invasive Lionfish In Belize
Joshua Balan†
Mentor(s): Greg Michalski

4:20 A New Model of Auditory Aging in Chinchillas: Chronic Application of Furosemide to the Round Window
788 *James Bundy†*
Mentor(s): Mike Heinz; Robyn McCain

4:40 Characterization of cell death induced by pharmacological activation of PP2A in Pancreatic ductal adenocarcinoma.
789 *Indiraa Doraivel†*
Mentor(s): Brittany Allen-Petersen; Garima Baral; Claire Pfeffer

THE LLLC COLLOQUIUM
THE LITERATURE, LINGUISTICS, LANGUAGES, & CULTURE COLLOQUIUM

STEW 218A 9:00 **800Ω**	Ferzan Özpetek's Gays and Gaze: Redefining the Cinematic Queer Gaze *Zachary McCormick†* Mentor(s): Elena Coda

STEW 218B 9:20 **801**	Cultural Comparison: US vs France basketball marketing *Sophia Hoffmann†* Mentor(s): Jessica Sturm
STEW 218A 9:20 **802**	Expanding Russian Vocabulary in a Cultural Context Through Chekhov Short Stories *Rowan Thornton†* Mentor(s): Amina Gabrielov

STEW 218A 9:40 **803**	Medieval Thoughts on Badgers and other Small Animals According to a 13th Century Bestiary *Taz Butler†* Mentor(s): Elizabeth Mercier

STEW 218A 10:00 **804**	Mapping the complementary principle in Spanish-English bilinguals *Sage Morrison†* Mentor(s): Daniel J. Olson; Lori Czerwionka
STEW 218B 10:00 **805**	Changes in Russian Media Language in Turbulent Times *Evan Landau†* Mentor(s): Olga Lyanda-Geller

STEW 218A 10:20 **806**	Analyzing prosodic features in the encoding of politeness for Spanish offers *Emma Marks†* Mentor(s): Daniel J. Olson; Bruno Staszkiewicz Garcia
STEW 218A 10:20 **807**	Uncertainty, Identity and Conservative Narratives in Tár *Isidore White†* Mentor(s): Emma Ben Hadj

STEW 218A 10:40 **808**	Sports Culture and Brain Injury Protocol in France *Emma Niecikowski†* Mentor(s): Jessica Sturm
STEW 218B 10:40 **809**	Culturally EnGRIND: An analysis of the socio-cultural impact of Grindr *Samuel J. Gray†* Mentor(s): Paige Frazier

STEW 218B 11:00 **810**	Motion Vectors in Akan *Shamiso Marondera†; Brynne Mills†; Yekaterina Yegorova** Mentor(s): Elena Benedicto; Eunice Opoku

STEW 218A 11:20 **811**	Bilingual Language Experience and Acceptability Judgements *Gage Mardlin†* Mentor(s): Daniel J. Olson
STEW 218B 11:20 **812**	Karate in France *Alexander Wills†* Mentor(s): Jessica Sturm

STEW 218A 12:20 **813**	Language, Ableism, and Identity *August Trepanier†* Mentor(s): Cara Kinnally
STEW 218B 12:20 **814**	Second language speakers' use of no sé 'I don't know': Patterns of use and pragmatic functions *Eryk Chazares†* Mentor(s): Lori Czerwionka

STEW 218A 12:40 **815**	Intercultural Competence within the BTS Fanbase *Ashelyn McKillip†; Gracie Pearson†* Mentor(s): Huai-Rhin Kim
STEW 218B 12:40 **816**	Fiction Editorial Internship *Nathaniel DeChambeau†* Mentor(s): Angelica Duran

STEW 218A 1:00 **817**	Rites of Passage in medieval German literature *Elizabeth Spendlove†* Mentor(s): Beate Allert

STEW 218A 1:20 **818**	I Am a Specialist in Black Magic: A Comparisson of Four Russian Fausts *Juan Nicolas Galindo Mantilla†* Mentor(s): Jeffrey Turco

STEW 218A 1:40 **819**	Is Sor Juana's Mother the Speaker in Her Famous Sonnet? *Odalis Campos Vasquez†* Mentor(s): Paul Dixon

STEW 218A 2:00 **820**	What a Little Verb Contributes to Telicity: The Case of Verbal Series in Akan *Katya Yegorova†; Brynne Mills*; Miso Marondera** Mentor(s): Elena Benedicto; Eunice Opoku

STEW 218A 2:20 **821**	Depictions of German-Jewish Resistance in World War II Films and Documentaries *William White†* Mentor(s): Beate Allert

STEW 218A 2:40 **822**	Kafka's Intentional Vagueness, and the Challenge of Translation *Steven Bass†* Mentor(s): Jen William

STEW 218A 3:00 **823**	Grammatical Gender Barriers to Gender-Conscious Translation of German Literature *Eleanor Dyas†* Mentor(s): Jen William

STEW 218A 3:20 **824**	English-Russian Philosophical Glossary: Losev, Florensky, and Bakhtin *Michael Linge†* Mentor(s): Olga Lyanda-Geller

STEW 218A 3:40 **825**	Animacy effects and the production of passive or active relative clauses in Mandarin *Yongjia Deng†* Mentor(s): Elaine Francis; Vanessa Sheu

POSTERS

APRIL 11, 2023

PURDUE MEMORIAL UNION BALLROOMS

Poster Presentation Abstract Number: 100
Presentation Time: Session 1: 9am-10:30am

How Long Does it Take to Digitize Archaeological Legacy Data

Author(s):

Isabelle Adnson† (Liberal Arts)

Abstract:

Scientific disciplines depend on the digitization of physical documents for analysis, preservation, and conservation. The cardinal inquiry of this project is to quantify the time costs of manual data transcription, data analysis, and manual mapping of archaeological data is GIS. Transcription is a vital qualitative research process synonymous with archaeology. In this study I am completing collections research on field logs from an original field research site located near the village of Gulkana, Alaska. Field logs from this site contain location data, morphology, recovery of material remains and assemblages, and detail the daily tasks of archaeological research participants. Using empirical methods of observation and timing, accurate parameters for data transcription can be ascertained. In order to maintain and implement archaeological data, transcription processes must be sustainable and efficient. This research is central to the contemporary landscape of archaeology as the ease of data capture has created an analogous proliferation in digital data sets. With an understanding of transcription time costs increase in clean and useable archaeological legacy data.

Mentor(s):

Kory Cooper (Liberal Arts); Emily Fletcher (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 101
Presentation Time: Session 1: 9am-10:30am

Triboelectric Properties of Electrospun Biomaterial Nanofibers for Wearable Sensors

Author(s):

Shivangi Agarwal† (Engineering, Honors)

Abstract:

Wearable sensors have the potential to revolutionize healthcare by allowing continuous monitoring of health-related parameters. In this regard, biomaterials have been an important part of the study for triboelectric wearables due to their potential properties, such as biocompatibility, biodegradability, flexibility, and stretchability. Furthermore, being able to manufacture those biomaterials at nanoscale helps in the precise control of the size and shape of these biomaterials, enabling the creation of sensors with high sensitivity and accuracy. This research systematically explores the different characteristics and advantages of producing the biomaterial-based nanofibers using the manufacturing technique of electrospinning. This manufacturing method is further employed under various parameters including the ratio of the solvents, the temperature, the voltage, the distance of the collector, and the pumping rate. These parameters affect the structure of the electrospun fibers and hence their triboelectric properties. Next, this research compares the triboelectric properties of the electrospun fibers with those of other common processing methods used for biomaterials. Moreover, we evaluate the mechanical and optical properties of electrospun biomaterial fibers. These properties further improve the overall performance of the produced nanofibers. Depending on various conditions, we determine their advantages and applications in the textile industry. We believe this research will be helpful to produce environmentally friendly biomaterial-based triboelectric sensors that can be used in smart textiles for cardiovascular sensors and other applications.

Mentor(s):

Wenzhuo Wu (Engineering); Robert Santo (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 102
Presentation Time: Session 1: 9am-10:30am

Thrust Characterization Method for Micropropulsion Systems in Microgravity

Author(s):

Anish Agrawal† (Engineering); Jacob Valdez† (Engineering, Honors)

Abstract:

The Film Evaporation MEMS Tunable Array (FEMTA) is a Micro-electromechanical System (MEMS) micropropulsion technology that uses ultra-pure deionized water to generate thrust for attitude control of small satellites. To verify FEMTA's capabilities, the FEMTA Suborbital Flight Experiment aims to test the technology's two main components: the Propellant Management Unit, comprised of a vapor-pressure-driven pump that feeds propellant to FEMTA, and a Thrust Measurement Unit, composed of a D'Arsonval voltmeter, a photo-interrupter, and a microcontroller. The goal of the Thrust Measurement Unit is to accurately measure the force of the FEMTA thruster in vacuum and microgravity. The proposed thrust characterization method involves measuring the force produced by the thruster's exhaust plume impinging on a torsion arm attached to a D'Arsonval meter. The photo-interrupter is used to monitor the position of the torsion arm as it is deflected by the force of the plume. The microcontroller monitors the deflection and supplies a voltage to the D'Arsonval to balance the impingement force. The voltage correction applied to the D'Arsonval meter is then calibrated to a thrust measurement, which achieves the goal of characterizing the FEMTA thrust as a function of analog voltage. The proposed measurement method is tested under vacuum using a modular setup that allows for experimental repeatability. The work presented here aims to optimize the physical arrangement of the measurement components and refine the digital control algorithm used to balance the impingement force. The goal is to improve the accuracy and reliability of the Thrust Measurement Unit.

Mentor(s):

Jesus Meza (Engineering); Steven Pugia (Engineering); Tony Cofer (Engineering); Alina Alexeenko (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 103
Presentation Time: Session 1: 9am-10:30am

Rocket Science at a Microscopic Scale: Measuring the Weight of an Eyelash

Author(s):

Efe Albay† (Engineering); Benjamin Roeder† (Engineering); Adithya Kolisetty† (Engineering)

Abstract:

The Film-Evaporation MEMS Tunable Array (FEMTA) is a micro-electromechanical system (MEMS) thruster that uses ultrapure deionized water to offer a unique, power-efficient, low-cost, and scalable solution for attitude control in smaller satellites. To comprehensively evaluate FEMTA's performance in space, two experiments are in development.

The Propellant Management Experiment (PME) aims to investigate the efficacy of a novel, passive propellant management system. This experiment assesses the functionality of a hydrofluoroether (HFE) based pressurant system that uses the vapor pressure of HFE to move propellant to the FEMTA thrusters.

The primary aim of the Thrust Measurement Experiment (TME) is to characterize the thrust from FEMTA with the joint operation of the vapor pressure zero-g propellant tank. The manufacturing team aims to consistently provide experiments with vacuum-proof and vibration-resistant parts and assemblies that are light, small, accurate, and cost-effective.

To manufacture the flight hardware a dedicated team was created. This team specializes in designing, manufacturing, and testing thrust stand prototypes, which are integrated into a single functional subsystem that satisfies the individual requirements of the thrust stand while being compatible with other subsystems to create a larger, more complex FEMTA system.

Experiment components need to be light, small and accurate due to the size and weight constraints of small satellites. These parts are being machined at student-run centers, namely the Purdue Aerospace Sciences Lab and Bechtel Innovation Design Center. This year's team builds on and tests the lessons learned to achieve a functional product.

Mentor(s):

Jesus Meza-Galvan (Engineering); Steven Pugia (Engineering); Anthony Cofer (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 104
Presentation Time: Session 1: 9am-10:30am

Documenting Puberty in the Ancient Nile Valley

Author(s):

Heidi Althaus† (Liberal Arts); Abigail Taylor‡ (HHS)

Abstract:

The purpose of this study is to estimate pubertal timing in Ancient Egyptian and Nubian populations during the New Kingdom and 3rd Intermediate periods. The results of this study bring important insights into research on pubertal analysis and methodology of ancient skeletal remains. This sample is from a new region and time period that has yet to be represented in research regarding pubertal analysis and can bring more range to the field of bioarchaeology and osteology. This study focused on a sample of 27 individuals, with an estimated age range of 7-24 years of age. Each individual was assessed for 8 different skeletal pubertal markers, which were then graded individually according to the Falys and Lewis Pubertal Status Recording Form. The results of this sample established that individuals between ages 15-24 were graded at peak height velocity (PHV) and above, while individuals ages 7-14 were graded prepuberty, initiation, and acceleration. These results will prove to be applicable to any complete skeletal sample that has individuals under 24 years old. This study concluded that it is possible to assign a pubertal stage to skeletal remains upon the analysis of 8 specific skeletal features. If a feature is absent, it makes the analysis more variable and the grade more susceptible to a higher range of pubertal stage. Four validity tests written by multiple authors were completed for accuracy. The methods of pubertal stage grading done with this sample have the potential to be repeated with alternative samples from different places of origin and time periods.

Mentor(s):

Michele Buzon (Liberal Arts); Emily Eiseman

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 105
Presentation Time: Session 1: 9am-10:30am

Environmental Justice

Author(s):

Tamia Austin† (HHS)

Abstract:

Environmental justice is the principle that everyone has a right to be protected from environmental pollution and live in a clean and healthy environment. Environmental injustice occurs when communities of lower socioeconomic status and/or minority communities have more than their fair share of environmental pollution. The objective of my research project was to compare the environmental and socioeconomic indicators across cities in Lake County, Indiana to characterize environmental justice issues in these communities. The Environmental Protection Agency's justice screening tool and the EnviroAtlas were used to identify cities within Lake County. With these tools, I abstracted environmental and socioeconomic data. Microsoft Excel was used for database management and analysis. Descriptive statistics were calculated for each city/zip code. Gary, IN, has the clearest indication of experiencing environmental injustice. St. John, IN has the clearest indication of a community without environmental injustice concerns. Gary has a high proportion of minorities (91% black; 5% white) and a majority of the population (35%) makes < $15,000 in household income. In comparison, St. John has a low proportion of minorities (2% black; 88% white); the majority of the population (63%) makes >$75,000 in household income. Considering environmental indicators, the US EPA ranked Gary at the 98th percentile in Indiana for wastewater discharge and 94th percentile for air toxins cancer risk. In St. John, these percentiles were 2nd and 0. Characterizing environmental and socioeconomic disparities is the first step to addressing these inequities.

Mentor(s):

Ellen Wells (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 106
Presentation Time: Session 1: 9am-10:30am

Hydraulic Development of Leaves

Author(s):

Connor Baker† (Agriculture)

Abstract:

Within trees, as spring arrives, many critical anatomical developments occur in tandem, both preceding and proceeding the first bud burst . Examples of these key anatomical developments are the emergence/expansion of leaves, deposition of new xylem, formation of functional stomata , and changes within the cuticle. Together these botanical traits comprise numerous physiological processes. Plant hydraulics, or the movement of water within the plant-environment system, is a physiological process that combines said anatomical traits into a cohesive and vital process. However, how these anatomical developments are coordinated during leaf expansion and their effects on conductance is currently unknown. Here we show how leaves expand, xylem is deposited, stomata are formed, and cuticles change in two co-occurring deciduous angiosperms, Tilia americana and Fagus grandifolia, over the spring of 2022 beginning at each respective species' day of first bud burst. Also, we attempt to harmonize these developmental processes to observe their effects on water conductance, specifically a plant's minimum rate of conductance (gmin). Throughout the season, as the leaves, xylem, stomata, and cuticles developed we observed a gradual decrease in the rates of water transpiration in droughted excised branches. Despite this, it is difficult to pin one anatomical trait to this increase in drought tolerance. We hypothesize that the development of functional stomata generates the observed control over water loss. This notion is supported by Brodribb et al., 2019 and the at large consensus of advancements in plant water relations. Though also within the consensus of what denotes desiccation tolerance , in droughted conditions the cuticles were the primary pathway of water loss, supported by Kane et al., 2020. We hope that the findings of this paper will provide a foundation for further investigation into how key anatomical traits are coordinated during plant development and how they influence a plant's ability to transport, utilize, and conserve water.

Mentor(s):

Scott McAdam (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 107

Presentation Time: Session 1: 9am-10:30am

Naturally derived mussel-inspired wet tissue adhesives

Author(s):

Lucy Baker† (Engineering)

Abstract:

Invasive wound closure methods like sutures and staples are increasing being replaced by tissue adhesives. An ideal tissue adhesive must be able to bond to wet tissues, be biocompatible and must not degrade into cytotoxic by products. Our research team has developed nature-inspired synthetic adhesives, particularly based on marine organisms such as mussels, barnacles, and oysters. We take cues from the way they attach themselves strongly onto surfaces in the ocean and synthesize glues that mimic their chemistry. Herein we have developed inexpensive, bio-derived, and non-toxic bio-based adhesives from zein and tannic acid (TA). Thirteen different adhesive formulations were synthesized using zein percentages ranging from 25-45 wt.% and tannic acid percentages ranging from 1-28 wt.%. The adhesion strength of all the adhesive formulations were tested on wet porcine skin using lap shear testing. The adhesives were allowed to cure for 2 hours in a humid environment at 37 °C. Lap shear adhesion strengths were calculated as the ratio of maximum load before failure and corresponding overlap area. Three of the best formulations were identified and their adhesion strengths were further studied at additional cure times of 15 min, 30 min and 6 h. The adhesives were finally benchmarked against a fibrin based commercial tissue adhesive.

Mentor(s):

Julie Liu (Engineering); Aishwarya Menon (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 108
Presentation Time: Session 1: 9am-10:30am

Comparing Demographics Between Blackford County Residents and Research Study Participants

Author(s):

Hannah Bard† (HHS)

Abstract:

Our team conducted a study about metal contamination and health among adults in Hartford City, Indiana. The objective of this analysis is to compare demographics between Blackford County residents and study participants to determine if our study population reflects the actual population of Hartford City and Blackford County, Indiana. This cross-sectional study recruited participants using posters, announcements through community partners, and door- to-door canvassing. Data were collected from May through December 2022 using an online survey which could be filled out by the participant alone or with assistance from study staff. There were 244 participants that provided full data on their gender, age and race. Study data was compared with data from the U.S. Census Bureau via the STATS Indiana website. Data were managed and analyzed with Microsoft Excel. Analysis included descriptive statistical analysis, and comparisons used Student's t-tests and Chi- square tests. Our study participants were 62.7% were female and 37.3% were male. Blackford County has a smaller proportion of women, with 50.6% female. In 2021, Hartford City's population was 6,067 people and Blackford county's population was 12,091 people. Thus, our study population was approximately 4.02% of the Hartford City population, and 2.02% of the Blackford County population. The Hartford City study median age (59 years) was higher than the overall county's median age (43.6 years). Initial results suggest our study population has more females and is older than the entire population. Analyses are ongoing. The results will help us understand how representative our study population reflects Blackford County.

Mentor(s):

Ellen Wells (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 109
Presentation Time: Session 1: 9am-10:30am

Analyzing benefits of Virtual Reality for college students with anxiety in America

Author(s):

Sandra Bern† (Engineering)

Abstract:

Mental health awareness has increased its importance in the last couple years, as it is no longer a taboo. Instead, it is a need and a right for everybody. Research shows that 1 in every 3 of U.S. college students suffer from anxiety and depression. The aim of this study is to explore the benefits that a virtual reality environment (VRE) could bring to the lives of college students with anxiety in two major aspects: first aid assistance and as a complement to current therapeutic practices. Research shows that not every person who struggles with anxiety can attend to a therapist, which can be due to many reasons. To conduct our findings, we interviewed professionals in the field of psychology and created online questionnaires for college students to better analyze their needs. With this collected information, we were able to create a sketch of the VRE. The speculated results from this study suggest an increase in access to mental health first aid, adherence to therapy and good outcomes from the therapy process. In later stages, we intend to measure our results through psychological scales and overall well-being of the administered participants prior and post pilot, in order for our team to measure any progress that happens throughout the experiment. To conclude, there is a need for mental health awareness and treatments, especially in young adults in the U.S.. Therefore, a solution is necessary and goes accordingly with the engineering challenges and sustainability goals that are proposed worldwide.

Mentor(s):

Heidi Parker (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 110
Presentation Time: Session 1: 9am-10:30am

Toxicity Assessment of Nanoparticle Mixtures in Welding Fumes

Author(s):

Katelyn Biggs† (HHS, Honors)

Abstract:

Welding is an essential modern manufacturing technology, with approximately 600,000 welders in the United States. The welding procedure creates an occupational exposure risk due to welding fumes (WFs). Acute exposure to WFs can result in eye, nose, and throat irritation, dizziness, and nausea. Chronic exposure to WFs includes pulmonary toxicity and neurotoxicity, such as lung dysfunction, asthma, bronchitis, cancer, nervous system damage, and enhanced susceptibility to viral or bacterial infections. WFs contain a complex mixture of harmful metal particles, with the primary components being iron (Fe) and manganese (Mn) nanoparticles. Fe induces oxidative stress, inflammation, pulmonary fibrosis, and genotoxicity. Exposure to Mn is associated with neurotoxicity and Parkinson's disease. WF research contains gaps as current studies focus on iron and manganese as individual exposures; however, toxicity resulting from WF exposure is based on mixtures of nanoparticle components. This study will evaluate how variations in metal oxide nanoparticle proportions alter pulmonary toxicity and WF-induced pathogen susceptibility and how the delivery method of NP exposure can modify toxicity. The delivery method of submerged cell culture with MTT assay assessment will look at different ratios of iron and manganese at different concentrations and time points. The delivery method of Air Liquid Interface Cell Exposure with LDH toxicity assessment will assess different ratios of iron and manganese with an interface that is like actual pulmonary exposure. This preliminary data demonstrates pulmonary toxicity and how the delivery method of exposure modifies toxicity. The utilization of this study can inform regulations for worker exposure to WFs.

Mentor(s):

Jonathan Shannahan (HHS); Li Xia (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 111
Presentation Time: Session 1: 9am-10:30am

Efficient simulation of degenerate optical parametric oscillator networks for combinatorial optimization

Author(s):

Spencer Bowles† (Engineering, Honors); Michael Foster† (Engineering)

Abstract:

A wide range of combinatorial optimization problems, such as the traveling salesman problem, are time-consuming to solve using existing computers. Therefore, improved algorithms and hardware are needed to address these challenges. Fortunately, a growing interest into computational systems known as Ising machines have shown them to be a promising tool for combinatorial optimization. The physical construction of these machines with networks of degenerate optical parametric oscillators (OPOs) allows for efficient solutions of the lowest energy states of these systems. However, there are numerous engineering challenges associated with the detailed simulation and fabrication of such machines. To facilitate the first step in simulation, the signal amplitudes of an degenerate OPO network are represented as Langevin equations, allowing stochastic integration techniques to be applied for approximate solutions. This study investigates current implementations of stochastic solvers; however, they are programmed in high-level languages, introducing significant overhead. This work will propose implementations in the C programming language to improve runtime performance. Several stochastic differential equation solvers will be implemented with strong orders of convergence of 0.5, 1.0, and 1.5, evaluating their performance in solving max-cut problems. Preliminary results for the modeling of a deterministic OPO network have been shown to replicate previous findings, but the stochastic elements have yet to be accurately simulated. Additionally, the researchers expect that noise will limit the accuracy benefits of higher order solvers. Efficient simulation of OPO networks would prove an effective method for finding approximate solutions to Ising models and thus, corresponding combinatorial optimization problems.

Mentor(s):

Peter Bermel (Engineering); Jie Zhu (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 112
Presentation Time: Session 1: 9am-10:30am

Resonances of multiple thin barriers in a 1D Schrodinger equation

Author(s):

Ethan Brady† (Science)

Abstract:

An early achievement in quantum mechanics was the discovery that the Schrodinger wave equation could explain the discrete energy states in the Bohr model of hydrogen. A more complicated scenario of recent mathematics research is diffraction of a particle around a corner, which is relevant for optics. The energy states are no longer positive, real numbers, but complex numbers called resonances lying in strings on several logarithmic curves in the complex plane.

A simpler scenario that also generates multiple strings of resonances is multiple thin barriers (Dirac delta functions) in one dimension. I investigate how the number, place, and shape of these strings of resonances changes with the strength and placement of the barriers in order to suggest patterns for the case of diffraction. I find a surprisingly simple relationship characterizing these strings based on a dominant pair of barriers, not necessarily consecutive ones, that maximize their combined strength times the distance between them. Then, I conjecture that the number of strings is at most the number of barriers outside this dominant pair. I provide evidence through asymptotic analysis and numerical computation, and future work will focus on a complete proof.

Mentor(s):

Kiril Datchev (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 113
Presentation Time: Session 1: 9am-10:30am

Purdue Free Pad and Tampon Program

Author(s):

Isabel Cava† (Liberal Arts); Megan Morley† (HHS, Honors); Elizabeth Salwitz† (HHS); Novalee Glass† (Agriculture)

Abstract:

Background: In February of 2020, Purdue University initiated the Free Pad and Tampon program to provide free feminine products in all women's and gender-neutral restrooms throughout campus academic buildings. Dispensers were placed throughout these restrooms and products are refilled by university staff. Stickers and magnets were placed on the dispensers and feminine waste containers to inform Purdue faculty and students of the program.

Methods: A Qualtrics survey was sent out to a sample of 5,000 Purdue University staff and student emails. The survey was formatted to gather data on how the program is being utilized as well as feedback on possible program improvements to facilitate more usage, awareness, and support.

Results: Students and faculty expressed their opinions on Purdue's Free Pad and Tampon Program. Based on the results, the greater majority of those who took the survey expressed their gratitude and support for the program. Respondents communicated that the program supports the health and wellness of Purdue students, however, they also communicated ways in which the program can be modified to improve user experience.

Conclusions: Students and faculty at Purdue University value and support the Free Pad and Tampon Program on campus. Improvements such as better-quality products, regular maintenance of product dispensers, and more educational efforts could be made to better the program. Furthermore, the placement of dispensers in men's restrooms, residence halls, and sports stadiums on campus can aid in program expansion.

KEYWORDS: Pad, Tampon, Free, Restrooms, Survey, Menstruation

Mentor(s):

Andrea DeMaria (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 114
Presentation Time: Session 1: 9am-10:30am

College Women's Sexual Risk Management Strategies on Nights Out with Friends

Author(s):

Hanna Cayton† (Liberal Arts)

Abstract:

This study aimed to understand how college women conceptualize and manage social and sexual risk on nights out. Specifically, the study investigates how the structures women put in place within their friend groups can both protect them and put them at risk during nights out with friends. We analyzed interviews conducted in 2018 with 22 young single women attending a large midwestern university. The data were collected using event-centered interviewing, which integrates photo data from an ecological momentary assessment app directly into the qualitative interview process. This technique enhances interviews as participants are able to provide detailed descriptions and timelines of the evening's events. We found that most women in the study were aware of the sexual risks that were associated with nights out drinking with their friends. As a result, women and their friend groups developed strategies in response to these perceived risks. The ground rules allowed women to have fun with their friends, however they could easily be broken, thus providing a false sense of security, and ultimately putting women at risk for unwanted sexual outcomes. Our findings highlight college women's agency in developing strategies to protect themselves and their friends from the sexual risks encountered on nights out, however they also show the limits of these strategies. Ultimately, these dynamics reinforce the idea that women are responsible for the unwanted sexual attention they get when out with their friends, underscoring the need for additional programming on sexual harassment, assault, and consent on campus.

Mentor(s):

Christie Sennott (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 115
Presentation Time: Session 1: 9am-10:30am

Indoor Navigating Survivor Emergency Response ROV (INSERR) for Flooded Indoor Environments: Prototype Progress Update

Author(s):

Pou Hei Chan† (Engineering); Wei Teng Sin‡ (Science); Chon Weng Lei‡ (Engineering)

Abstract:

Indoor Navigating Survivor Emergency Response ROV (INSERR) is a novel remotely operated vehicle (ROV) system equipped with 6 thrusters for 5 degrees-of-freedom. It is designed to conduct search and rescue operations in flooded indoor environments and allow for precise manoeuvring at surface and submerged navigation through common choke points such as doors and windows. This poster reports on the progress and development of INSERR since spring 2022. The update includes changes to the external paneling and mesh covering to prevent foreign objects from entering the structure of the ROV and tangling with the thrusters. A finalized list of the most applicable rescue equipment and first aid supplies has been selected, and the extra enclosed volume allows for additional modular payload space. This capacity allows the ROV to carry a duplicate set of payloads, giving it the ability to sustain 2 rescued flood victims simultaneously. A new variable buoyancy system using 2 independently controlled ballast tanks allows for quick surfacing and precise buoyancy control. The battery canister has been rearranged to allow for water surface level access to the payload bay, which is now illuminated with LEDs, allowing rescued flood victims to see the payload bay even in zero visibility floor water. A new sonar deploying mechanism has been designed with an impact resistant mechanism to minimize the risk of accidental collision of the retractable 360-degree sonar. Additional progress has been made on the ROV structure and electronics in the main canister.

Mentor(s):

Byung-Cheol Min (Polytechnic Institute); Pou Ut Chan (Macao Polytechnic University)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 116
Presentation Time: Session 1: 9am-10:30am

Video Analytics for understanding Animal Behavior

Author(s):

Shaan Chanchani† (Engineering); Sohum Thadani† (Science); Brooklynn Fugate† (Engineering); Krishna Bendishankara† (Engineering); Junze Li† (Engineering); Zilu (Johnny) Jin† (Science)

Abstract:

The aim of this project is to investigate the behavior and density of animals, specifically those hunted by chimpanzees, in Senegal. Camera traps that capture images when an animal is detected are placed in various locations. The project began by applying a detection tool to identify and localize animals in an image and a classifier to assign a species to the animals. However, the detector model consistently detects non-animal objects as animals, which causes the classifier to malfunction. For this project, we aim to identify and measure potential causes of poor detector performance, such as resolution, lighting, and blurriness. That way, we can improve the accuracy of the classifier by decreasing the number of input images with false detections.

To begin our experiment, we labeled 200 images from 40 camera sites. With the intersection over the union metric, we can identify which bounding boxes from the localization tool are false detections. Using these statistics, we aim to correlate imagery measurements to potential system performance. One method of imagery measurements is to assess the degree of blur by comparing it with the detection result, allowing for a determination of whether blur positively or negatively impacts the detection method. The variance of the Laplace transform is often employed as a key metric for this purpose. By calculating the variance, we can determine the level of blurriness in an image. In future work, we intend to modify bounding box detections by adjusting resolution, lighting, and contrast to improve the accuracy of the classifier.

Mentor(s):

Amy Reibman (Engineering); Haoyu Chen (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 117
Presentation Time: Session 1: 9am-10:30am

Factors related to the questions parents ask during book reading

Author(s):

Elizabeth Clark† (HHS, Honors); Cayla Woten‡ (HHS, Honors); Sophie Donegan‡ (Management, Honors)

Abstract:

Parent-child book reading is an important context within children's early learning environment. Recent survey work has suggested that for preschool aged children, both parent (e.g., parent’s beliefs of their child’s understanding of mathematics) and child factors (e.g., child gender) are related to the complexity of the questions parents ask during number book reading (Uscianowski et al., 2020). In the current study, we sought to test for a replication of these findings and also extend this line of work by investigating the variation in the types of questions parents ask as well as the factors that associate parents' spontaneous tendency to ask number related questions. We did not replicate the original findings, instead finding non-significant relations between child gender and the measures of question complexity as well as non-significant relations between parents’ perceptions of their child’s number skills and the measures of question complexity. Across the number questions parents came up with, parents varied the complexity of the questions they asked. In exploratory analyses, we found that books with higher word counts and those that included more numerical representations were associated with parents asking less complex questions. When considering parents' spontaneous number-related questions, we found that parents who had higher levels of anxiety around doing mathematics-related activities with their children asked fewer overall number related questions and also asked less complex questions during number books. These findings help inform our understanding of how number-related prompts can differ by the design of the book as well as parents’ mathematical anxiety.

Mentor(s):

David Purpura (HHS); Connor O'Rear (University of Notre Dame)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 118
Presentation Time: Session 1: 9am-10:30am

Utilization of Spatial Analysis to Investigate IU Health Arnett's High Patient Fall Rate

Author(s):

Colleen Cole† (HHS, Honors)

Abstract:

At IU Health Arnett Hospital in Lafayette, IN, patient falls happen more frequently than at other hospitals in the surrounding area, a problematic trend that has been ongoing since before the pandemic and has not seen any improvement. This is a cause of great concern because each time a patient falls, hospital staff must come to their assistance and then follow a thorough reporting protocol, which reduces the number of staff members available to help with other concurrent situations occurring elsewhere. That is not to mention the risk of serious injury and possibly even death to the patient from the fall itself. IU Health Arnett has acknowledged that this issue needs to be addressed, however it is hard to find solutions considering a clear cause has not yet been established. Many factors exist that could contribute to the hospital’s high frequency of patient falls, but only a select few have been taken into consideration thus far. Therefore, the purpose of this research is to utilize spatial analysis to investigate a potential relationship between patient falls per floor and nursing staff population.

Mentor(s):

Katie Jarriel (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 119
Presentation Time: Session 1: 9am-10:30am

Identification of conserved eukaryotic gene products in novel mycobacteriophage PurduePete

Author(s):

Jade Coxon† (Engineering); Brandon Mar‡ (Engineering); Gabriella Burke‡ (Agriculture, Engineering); Lizzie Adams‡ (Science); James Lin‡ (Agriculture, Engineering); Alaina Gartner‡ (Agriculture); Sophia Palant‡ (Pharmacy); Lily Esterline‡ (Agriculture)

Abstract:

Bacteriophage, a type of virus that infects bacteria, was discovered 100 years ago, initially isolated with a plaque assay in the 1940s. A mycobacteriophage is a subtype of bacteriophage that specifically infects mycobacteria. Since the introduction of DNA technologies and efforts to identify a plethora of bacteriophages, over 10,000 bacteriophages have been identified with 1,500 sequenced. Bacteriophage discovery has aided in genetic editing techniques and in disease treatment. However, in order to be able to expand on these capabilities, there is a need to identify more bacteriophages and sequence the genomes of these viruses, as they outnumber bacteria 10 to 1. The mycobacteriophage PurduePete was discovered in 2022 and annotated using the gene sequence annotation programs DNA Master, Phamerator, NCBI BLAST, Starterator, HHPred, and DeepTMHMM in order to discover the functions of its genome. Several gene functions were discovered within the base pair region 4785 to 40645 of PurduePete that are present in eukaryotes, prokaryotes, and bacteriophages, suggesting that these gene functions may be conserved. This includes the functions of helix-turn-helix DNA binding protein in the base pair region 17644 to 17947 and histidine triad protein in the base pair region 6280 to 6858. Developing a greater understanding of shared gene products between bacteriophages and eukaryotes will be integral in creating bacteriophage-based technologies that support already existing eukaryotic functions; the aforementioned proteins helix-turn-helix and histidine triad have antiviral and tumor suppression capabilities. These protein functions present in bacteriophages could be scaled and utilized in the development of novel therapeutics.

Mentor(s):

Kari Clase (Agriculture); Harry Ashbaugh (Engineering); Daphne Fauber (Engineering); Aaron Gin (Engineering); Adam Quinn (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 120
Presentation Time: Session 1: 9am-10:30am

Investigation of Occupational Exposure to Pesticides, a Potential Risk Factor for Parkinson's Disease

Author(s):

Perry Curtis† (HHS, Honors); Sharon Kulali* (HHS); Rebecca Eyrick* (HHS); Hannah Bard* (HHS)

Abstract:

Parkinson's disease (PD) is a debilitating neurological disease that is becoming more prevalent in the US. Studies have been geared towards identifying genetic factors and have left environmental factors understudied. In order to reduce PD incidence, it is crucial to research what factors are causing this increase. Environmental factors, including occupational pesticide exposure, have been shown to contribute to the development of PD. Our previous literature review demonstrated that occupation is linked to pesticide exposure. The goal of this analysis is to collect historical data on occupation and residence in two cross-sectional studies of rural Indiana residents in order to estimate lifetime exposure to pesticides. This analysis focuses on occupations with continuous exposure to chemicals such as the pesticides paraquat, atrazine, and rotenone which have been found to be linked to neurological toxicity that causes PD as well as reproductive issues. Using participants' past work and home addresses and cross-referencing them with data on superfund sites and historical pesticide usage data we can also help determine what they might have been exposed to. Results from the studies also showed that the most reported occupations were in manufacturing, shipping, and academia however, the only occupations in the literature review linked to pesticide exposure were those in agriculture and the shipping of goods related to agriculture. Review is still ongoing of the 92 participant's biological samples to determine which participants were likely to have historic exposure to pesticides; this will inform further work on pesticides as potential risk factors of PD.

Mentor(s):

Ellen Wells (HHS); Edem Sededji (HHS); Salma Akhter (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 121
Presentation Time: Session 1: 9am-10:30am

Whats the Best Growth Medium for the Biowall?

Author(s):

Ajay Dalal† (Polytechnic Institute); Siqi He* (Polytechnic Institute)

Abstract:

A service learning project is developing a Biowall for the new children's wing of the West Lafayette Public library. A Biowall is a natural air filter that uses plants to improve Indoor Environmental Quality. One important aspect of this project is the growth medium. The plant growth medium currently consists of 40 percent coco coir, 30 percent charcoal chips, and 30 percent Growstone. Growstone was widely used in the agriculture sector as it provided excellent water retention and aeration but it is no longer easily accessible.

The focus of this research is to develop a new growth medium that has similar characteristics to Growstone. Charcoal chips and coco coir are commonly used in horticulture and hydroponics to cultivate a wide range of plants. However, their effectiveness as growth medium can be enhanced by adding another ingredient that allows soil aeration and further improves water retention.

An alternative to Growstone is Perlite or Horticultural Vermiculite. Perlite is a lightweight, porous volcanic rock that is often used as a soil amendment. When added to a growth medium, it improves drainage, aeration, and water retention, which are crucial factors for plant growth. Horticultural Vermiculite on the other hand, is a mineral that has been expanded from heat-treatment, forming a lightweight and absorbent material. It can hold water and nutrients and provide a stable environment for plant roots.

Tests are being conducted on different ratios of growth medium utilizing Perlite or Horticultural Vermiculite. Two tests are being conducted: one to gather data on moisture levels within the medium over time and one to determine aeration. Aeration will be determined by how much pressure is built up in a chamber in which a fan will attempt to pull air through the growth medium. The moisture level is conducted by watering the medium and monitoring moisture levels over time using soil moisture sensors.

Mentor(s):

Bill Hutzel (Polytechnic Institute); Dhanurja DeSilva (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 122
Presentation Time: Session 1: 9am-10:30am

Medication Management Practices in Indiana Grade Schools

Author(s):

Naomi Davis† (Pharmacy)

Abstract:

Background: According to the US Centers for Disease Control and Prevention (CDC), over 40% of school-aged children and adolescents suffer from at least one chronic condition. For many of these students, taking medications during school hours require a consistent medication schedule. Currently, there is not a complete understanding of the current practices related to medication management in school settings. The goal of this study was to assess medication management practices via a survey of school health personnel across the state of Indiana.

Methodology: This was a cross-sectional study design using an online survey administered via Qualtrics. The survey was developed based on the research team's prior work and a review of literature. The questionnaire contained the following sections: 1) participant demographics; 2) background information about the school and school health personnel; and 3) questions related to medication management practices at the start, throughout, and end of the school year. The research team conducted a manual search of contact information on the websites of all school districts in Indiana. The Qualtrics survey was then distributed via email with four reminder emails scheduled until March 9, 2023.

Results: Thus far, the survey has received 223 responses and is scheduled to close on March 20, 2023. The final poster will include results from full analysis of survey results.

Implications/Future Work: The analysis is expected to identify gaps in medication management practices in school settings. The findings will inform development of interventions to better support school health personnel and improve health conditions of students.

Mentor(s):

Ephrem Abebe (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 123
Presentation Time: Session 1: 9am-10:30am

Revealing the features of interdisciplinary communication in a Biology Integration Institute

Author(s):

Eanna Nicole DeGuzman† (Honors)

Abstract:

In the last decade, science has shifted to broader interdisciplinary (ID) approaches in research to tackle global challenges, moving away from narrower discipline-specific approaches. ID research and collaboration face persistent challenges at the individual and organizational levels, including attitudinal resistance, communication gaps, a lack of a shared objective and collegial environment. The Five C's of ID collaboration framework emphasizes the need of effective communication across disciplines to foster a sense of belonging among ID researchers. To overcome communication barriers, activities should promote creation, negotiation, and communication of new knowledge and establish an inclusive space where disciplinary boundaries can be transcended.

Our study is part of an evaluation research project for an NSF-funded Biology Integration Institute (BII) comprising researchers from various disciplines – biomedical engineering, biology, and computer science. As internal evaluators, we aim to characterize institute activities to understand their contribution towards achieving the institute's goals. This project aims to answer the question: What are the features of the interactions between institute members during weekly research and update meetings?

Using qualitative research methods, we analyzed the weekly meetings to identify the agenda and the characteristics of members' interactions. Over time, this activity has evolved to serve multiple purposes, such as providing a social setting, identifying potential collaboration opportunities, and enabling members to learn from their peers.

This study reveals the emergence and maintenance of interactions between individuals and disciplines, which shape ID communication, collaboration, and research initiatives. Such dynamic activities require continuous evaluation to assess their effectiveness in facilitating ID research.

Mentor(s):

Stephanie Gardner (Science); Soumi Mukherjee (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 124

Presentation Time: Session 1: 9am-10:30am

Fatty acid composition of loin and fat samples from Large Black and Duroc-sired carcasses fed diets supplemented with or without fiber

Author(s):

Alicia Denton† (Agriculture)

Abstract:

As pork production in the U.S. has become more integrated, small farms have turned to niche pork production systems to stay in business. Niche pork producers utilize minor swine breeds, also known as heritage breeds, such as the Large Black, due to meat quality traits and foraging behaviors. However, little research has been done comparing heritage breeds to commercial breeds. This study utilized a 2 x 2 factorial design to evaluate carcass characteristics of Large Black (LB) (n = 25) and Duroc-sired (DS) (n = 40) pigs fed a corn-based diet (CON) or a corn-based diet supplemented with alfalfa and wheat middlings (FIB). Pigs were allotted into pens based on genetics, sex, and body weight. After 6 phases of grow-finish diets, all pigs were harvested, and a loin and fat sample were collected from each pig. Samples were ground and sent to University of Missouri for fatty acid (FA) analysis. Data were analyzed using SAS v9.3 (Cary, NC). Fiber increased saturated fatty acid content in both loin and fat samples. FIB pigs and female pigs had an increased number of very long-chain FA in loin samples. No breed differences were observed in loin samples. FIB pigs and DS pigs had an increased number of very long-chain FA in fat samples. No sex differences were observed in fat samples.

Mentor(s):

Kara Stewart (Agriculture); Brian Richert (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 125
Presentation Time: Session 1: 9am-10:30am

TRANSRACIAL & IN-RACIAL ADOPTIONS: ANXIETY LEVELS DO NOT DIFFER

Author(s):

Tulsi Desai† (HHS)

Abstract:

Transracial adoptions can be challenging and anxiety-inducing for adoptive parents as they learn to communicate and navigate the child’s identity along with a newfound family identity (Nelson & Colaner, 2018). Thus far, studies have found that parents who adopted transracially did not differ in parenting stress or parenting styles as compared to those who adopted in-racially (Farr et al., 2009). However, no studies have investigated the difference in anxiety levels between transracial & in-racial adoptive parents. To address this literature gap, the current study used data from the Early Growth and Development Study (EGDS; Leve et al, 2019) - a longitudinal study of 561 families where children were domestically adopted at birth, which included both transracial (n=224) & in-racial (n=333) adoptions. We examined adoptive parents' anxiety when their adopted child was six years of age using the State-Trait Anxiety Inventory (STAI) & tested whether anxiety levels were equivalent for parents with transracially & in-racially adopted children using value equivalence tests in Statistical Analysis System (SAS). The equivalence tests showed that for both types of adoptive parents, the 90% confidence interval (primary caregiver: -0.87, 1.99; secondary caregiver: -1.09, 1.76) for the mean difference was completely contained within the equivalence bounds (-4.5, 4.5, p < 0.0001. Thus, we can conclude that the STAI levels of the two adoptive parent groups are statistically equivalent. Results add to a small yet growing body of literature showing that transracial adoptions should not be viewed as a struggle (or stress-inducing) for adoptive parents.

Mentor(s):

Kristine Marceau (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 126
Presentation Time: Session 1: 9am-10:30am

Superimposed Craters as a Window into the Formation of Ice Mounds in the South Polar Region of Mars

Author(s):

Audrey Durham† (Science); Imani Lawrence‡ (Science)

Abstract:

Ice mounds in the northern and southern polar regions of Mars represent records of past climate. To decipher these climate records, we are searching for superimposed craters on top of these ice mounds that can be used to place age constraints on the ice. We use the geospatial software JMARS to inspect high-resolution images from Mars-orbiting cameras to search for craters on the ice mounds' surfaces. These images allow us to find newly formed craters superimposed on each ice mound, giving us insight into its age. A dichotomy exists in Mars' polar regions, where the northern ice cap is thought to be younger than the southern ice cap, but it is unknown if this hemispheric difference also holds for these ice mounds. Our work will provide evidence to support or reject this hypothesis. At the conference, we will present our ongoing results regarding crater counting on ice mounds, and their implications regarding age and ongoing surface processes in the Martian southern polar region.

Mentor(s):

Mike Sori (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 127
Presentation Time: Session 1: 9am-10:30am

Presentation Withdrawn.

Poster Presentation Abstract Number: 128

Presentation Time: Session 1: 9am-10:30am

Accuracy and Precision of Digital Forest Measurements

Author(s):

Grace Estep† (Agriculture, Honors)

Abstract:

As the need to capture atmospheric carbon to offset emissions becomes an increasingly important issue over the next few decades, the ability to rapidly monitor forest growth and development would be extremely beneficial for timber producers and conservationists. Digital technologies are being developed with the potential to reduce measurement times over traditional manual methods by orders of magnitude. These technologies also have the potential to be both more accurate and precise than measurements taken by hand. This project compares diameter at breast height (DBH) measurements of a stand of walnut trees taken on the ground with those taken both by LiDAR (Light Detection and Ranging) and through camera-based image measurements. The stand is composed of Purdue #1 walnut trees and is grown and maintained by ArborAmerica in Shadeland, IN. We are testing the precision and accuracy of these digital technologies to determine suitability for widespread, end-user application. Preliminary results suggest some bias in the digital platforms, suggesting further refinement is needed before widespread application. Nevertheless, once this and other methods are fully operational, digital measurement technologies will provide an immense advantage in the field of forestry and natural resource conservation.

Mentor(s):

Mike Saunders (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 129
Presentation Time: Session 1: 9am-10:30am

Assessment of Tobacco-Free Nicotine Pouch Character and In-Vitro Cytotoxicity

Author(s):

Jacob Eyster† (HHS, Honors)

Abstract:

Touted as a safer alternative to cigarettes and traditional snus, the tobacco-free nicotine pouch (TFNP) has enjoyed burgeoning growth in the nicotine product market. The body of extant literature as it relates to this topic is small, however, and the extent of this “safeness” is unknown; the concentration at which TFNPs induce cell damage remains undetermined. This investigation is intended to doubly expand the aggregate of information available regarding the TFNP, represented in this study by five flavors of popular pouches across two concentrations. First, through characterization via mass spectrometry, relative nicotine quantities are established and compared to expected values, and non-nicotinic contents are indexed for each flavor to delineate commonalities. Second, cellular response is tested via exposure of pouch contents to primary gingival keratinocytes—cells populating the outer layer of gum tissue—which interface most closely with TFNPs upon insertion. Upon exposure to differential concentrations, cytotoxicity (cell death) is assessed across the cell line, in addition to rates of inflammation and oxidative stress, both cardinal indicators of cellular disruption. Work on this project remains ongoing; spectrometric data confirms adherence to established tolerances with respect to nicotine, and work on exposures has begun. At its conclusion, this project will examine differential rates of cytotoxicity, oxidative stress, and inflammation across an oral keratinocyte cell line exposed to varying flavors and concentrations of TFNPs; results for each concentration and flavor will inform a holistic understanding of the bearing that TFNPs exert on the course of cellular status in the oral tissues.

Mentor(s):

Jonathan Shannahan (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 130
Presentation Time: Session 1: 9am-10:30am

Earth History Visualization

Author(s):

Mahad Faruqi† (Science); Piper Hale† (Engineering); Xander Shillings† (Engineering)

Abstract:

The Time Scale Creator was originally created so that anyone would be able to view geological data from across the world in depth. The program is free to download and there is already an online version that has been made so that it is easier for anyone to use TSC without having to download it onto their computer. The Earth History Visualization team's goal this semester is to create a new website that is more streamlined and user friendly, allowing the tool to be used by

a wider range of people. Some examples of things that we aim to work on include improving user friendliness, making a more cohesive user interface, having easier to understand settings, and the option to easily switch to different data packs. The Time Scale Creator website should

be able to be used easily by both researchers and high schoolers alike.

Mentor(s):

Jim Ogg (Science); Aaron Ault (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 131
Presentation Time: Session 1: 9am-10:30am

Porcine reproductive and respiratory syndrome virus viral load assay quantification through flow cytometry

Author(s):

James Fazioli† (Science, Honors)

Abstract:

PRRSV directly reduces the number of piglets produced by a sow and costs the swine industry an estimated $664 million annually. Quantitative PCR can be used to measure the viral load in a tissue; however, it cannot distinguish between non-infectious nucleotide residues and live viral particles. Classically, live virus has been measured using “tissue culture infective dose for 50 % infection” (TCID50), however this process is tedious, low throughput, expensive, error prone and produces heteroskedastic results. To address this issue, we sought to develop a novel and highly quantitative alternative based on intracellular staining and flow cytometry. In this approach immortalized MARC-145 cells are infected in vitro, and virus positive cells quantified at a fixed time point. To demonstrate the validity of the designed procedure we are evaluating the impact of multiple experimental factors on the outcome of our assay. First, we determined the optimal time for measurement by evaluating viral infection rate at multiple time-points post infection. Additionally, we examined the linearity of the assay to determine the optimal concentration of viral dilution for plate infection. To evaluate well-to-well and plate-to-plate consistency we evaluated the intra and inter-assay variance. Intra-assay variance was calculated by analyzing identical sample triplicates on the same plate, while inter-assay variance was any through analyzing identical triplicates on separate plates. Finally, we have utilized this assay to evaluate the impact of freeze thaw cycles on PRRSV integrity. Further research will compare the relative effectiveness of this method compared to the classical TCID50 approach.

Mentor(s):

Alex Pasternak (Agriculture); Maggie Mulligan (Veterinary Medicine); Kaylyn Rudy (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 132
Presentation Time: Session 1: 9am-10:30am

Characterizing Cellular Composition Changes in Milk with Heat-Stressed and Moringa Supplemented Sows

Author(s):

Elizabeth Fisher† (Agriculture)

Abstract:

Lactating sows are especially vulnerable to heat stress due to heat produced from milk synthesis. To maintain body temperature respiration rates increase. At temperatures above 80 F respiration rates double or triple. In extreme cases of heat stress, the internal body temperature rises. Heat exposure increases oxidative stress and inflammation and reduces milk production leading to lower litter growth rate. Milk production is determined by number and metabolic activity of mammary epithelial cells. Leukocytes are immune cells responsible for inflammatory responses and their populations increase with oxidative stress. We hypothesize oxidative damage due to heat stress kills epithelial cells and increases leukocyte populations in the gland, and thus epithelial cells and leukocytes increase in milk. Our objective was to determine the effect of cooling heat stressed sows on respiration rate (RR) and rectal temperature (RT) and the number and distribution of cells in milk. During a two day heat wave, lactating sows were assigned to heat stress (HS, n=9) or cooled (C, n=9) treatments. Farrowing crates of C were equipped with conductive cooling pads. RR was recorded every 30 min and RT was recorded every 60 min for 48 hrs. Milk was collected at the end of this period. Number of live/dead cells was counted. Cells were smeared on glass slides and differentially stained and populations counted under microscopy. Cooling reduced RT and RR (p < 0.05) but had no effect on cell number (p> 0.05). Analysis of populations is ongoing.

Mentor(s):

Theresa Casey (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 133
Presentation Time: Session 1: 9am-10:30am

Compression Molding of Hybrid Continuous and Discontinuous Fiber Composites

Author(s):

Ludvik Fjeld† (Engineering)

Abstract:

Compression molding with long discontinuous fiber-reinforced thermoplastics allows for highly complex geometric parts with the benefit of reduced weight compared to its metallic counterpart. However, with fiber-reinforced thermoplastics, the strength of the material is dependent on the length and orientation of the fibers, which means that discontinuous fibers lack the strength and predictability that a long continuous fibers part offers. Furthermore, the strength characteristics of discontinuous fibers are highly variable due to the stochasticity in fiber orientation. In contrast, continuous fibers provide higher strength characteristics but are more difficult to form into complex shapes, thereby limiting the geometry complexity that is possible without significantly increasing the costs of manufacturing. This study demonstrates the potential benefits of a hybrid of the two fiber forms by replacing a small volume of discontinuous fiber platelets with preforms printed with continuous fiber in a compression molding process. The hybrid material process was demonstrated for a representative geometry of an aircraft overhead support bracket. Continuous fiber preforms were engineered to be printed flat and to unfold into a three-dimensional structure through the concurrent flow of continuous and discontinuous fibers. Further, the three-dimensional continuous fiber design was based on the part's structural requirement and loading conditions. Six brackets were manufactured only with the continuous fiber preforms and six with only discontinuous fiber platelets. The brackets were tested until ultimate failure in a universal test machine with a custom-made fixture. The results of the mechanical tests showed an improvement of 99.6% in the load at the onset of material failure by using the continuous fiber preform and a decrease in the coefficient of variance of 46%. The findings of this study demonstrate the potential for this new high-rate manufacturing process for the aerospace industry which will meet their rising demand for lightweight high-performing parts.

Mentor(s):

Eduardo Barocio (Purdue University)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 134
Presentation Time: Session 1: 9am-10:30am

Effects of developmental methylmercury exposure on eIF2 signaling pathway in the presence of secondary stressors

Author(s):

Mia Fleisher-de Kozan† (Science)

Abstract:

Eukaryotic initiation factor 2 (eIF2) plays a critical role in mRNA translation as the phosphorylation of the eIF2α subunit inhibits translational initiation. Commonly categorized as a stress response, phosphorylation of eIF2α is associated with changes in healthy aging, memory, behavior, and nervous system development making it critical to the understanding of neurodegenerative disease. To understand the effects of developmental methylmercury (MeHg) exposure on human induced pluripotent stem cell (iPSC)-derived neuronal cultures, eIF2 regulation was analyzed via western blot assays. Investigation of MeHg developmental exposure has shown an effect on the regulation of the eIF2 pathway in mature neurons via western blot in addition to genome-wide gene expression changes in the eIF2 pathway. Cells exposed to 1 µM during development showed an increase in expression of phosphorylated eIF2α compared to controls. To further assess the long-lasting effects of the primary MeHg exposure, sodium arsenite (NaAsO2), known to impact eIF2 regulation, was used as a secondary stressor. Preliminary results of NaAsO2 secondary exposure show an increase in eIF2 activation in samples exposed to 200 µM NaAsO2, including prior MeHg-exposed cells. Future experimentation with additional concentrations of NaAsO2 is necessary to further evaluate the effects of a secondary stressor.

Mentor(s):

Aaron Bowman (HHS); Anke Tukker (HHS); Xueqi Tang (HHS); Jennifer Schmitz (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 135
Presentation Time: Session 1: 9am-10:30am

The Use of Objects and People by Infants to Support Walking in Their Home Environment

Author(s):

Reagan Frame† (HHS); Maia Lynch† (HHS)

Abstract:

Over the first few years of life, infants' muscle development, motor coordination, and balance skills rapidly develop. As infants learn to walk, they rely on a multitude of objects and people to support their early walking. However, little is known about the different types of walking opportunities that infants turn to in their natural home environment, and how relatively beneficial or detrimental each option is. For our project, we examined the types of walking that infants engage in during an hour-long naturalistic observation in their homes. Our 13-month-old participants could walk independently (e.g., able to walk 10 ft independently without additional support or falling). We used Datavyu, a video coding software, to code for the length of walking bouts, frequency, types of walking, parent proximity, and how the walking bout ended. The types of walking examined included push toys, cruising, parent supported walking, and walking while holding onto a toy. Our findings contribute to a better understanding of the benefits and drawbacks of each type of walking that infants engage in during free-play in the home environment.

Mentor(s):

Laura Claxton (HHS); Paige Thompson (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 136
Presentation Time: Session 1: 9am-10:30am

Effects of Potential Bacterial Adenylyl Cyclase Inhibitors on Human

Author(s):

Camryn Fulton† (Pharmacy); Emily Davidson† (Pharmacy)

Abstract:

The use of bacterial adenylyl cyclase inhibitors has been a previously approved treatment for virulent factors such as Bordetella pertussis adenylyl cyclase toxin (ACT) and Bacillus anthracis edema factor (EF), which both demonstrate adenylyl cyclase activity. The symptoms of ACT and EF, whooping cough and anthrax respectively, are the result of these factors increasing adenylyl cyclase activity thus leading to increased levels of cyclic AMP in human cells. The inhibiting molecules are derivatives of Adefovir (PMEA) and are intended to selectively inhibit adenylyl cyclases in bacteria by mimicking the structure of nucleotides. Adefovir binds to the active site of adenylyl cyclase with a higher affinity than its endogenous ligand, ATP, due to stronger Van der Waals forces. Prevention of ATP binding to the active site of adenylyl cyclase prevents it from being converted into cAMP. In order to be effective in human use, it is vital that these inhibitors do not affect human adenylyl cyclases or cells. In collaboration with the laboratory of Dr. Zlatko Janeba we sought to evaluate several bacterial adenylyl cyclase inhibitors at representative human adenylyl cyclase isoforms. To explore the effects of these compounds on adenylyl cyclase activity, we used a novel cell model, HEK Δ3/6 cells that express adenylyl cyclase 1 (AC1), AC2, or AC5.. Cells were used in assays measuring both cyclic AMP (cAMP) accumulation, as well as ATP levels to determine cell viability and toxicity, respectively. Compounds that show a lack of cAMP inhibition and no toxicity effects show promise as safe therapeutic treatment of pathogenic bacteria in humans.

Mentor(s):

Val Watts (Pharmacy); Brent Smith (Pharmacy); Zlatko Janeba

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 137
Presentation Time: Session 1: 9am-10:30am

UPLeft: Pick Up Leftovers, Uplift Those in Need

Author(s):

Veronica Galles† (Management, Honors)

Abstract:

40% of food waste comes from restaurants, grocery stores, and food service companies in the United States (RTS, 2023). There are 19,634 people alone living in poverty in West Lafayette, IN (USCB, 2022). In today's day and age, we often think food insecurity and hunger is behind us, when in fact it still affects lives every day. UPLeft hopes to solve this problem by picking "UP" "Left"overs and uplifting those in need. It is a service that picks up leftovers from restaurants at the end of closing shift, and delivers the food to homeless shelters/food pantries at their earliest convenience. The purpose of this research was to conduct further market analysis on if this approach was best for customers. I asked the following question: "How do restaurants best donate and homeless shelters/food pantries best receive food to reduce food waste and feed the hungry? (i.e. In what state (hot or cold), and at what frequency (daily, weekly, etc.)?)." To answer this question, I conducted seven in-person interviews with restaurants in West Lafayette, IN and two phone interviews with homeless shelters/food pantries in the Lafayette community. I asked them questions (see Appendix A) in addition to follow-up and contact information. My results were categorized into two actionable items: (1) On a daily basis, pick up already made food (hot) from restaurants and donate to homeless shelters. (2) On a weekly basis, pick up ingredients/nonperishable food items (cold) from restaurants and donate to food pantries.

Mentor(s):

Lindsay Rosokha (Management); Arnold Chen (Purdue University)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 138
Presentation Time: Session 1: 9am-10:30am

Data Mining Supernovae from the Zwicky Transient Facility

Author(s):

Braden Garretson† (Science)

Abstract:

The upcoming Vera C. Rubin Observatory will provide exciting opportunities to investigate hundreds of thousands of supernovae and their host galaxy environments. However, this large influx of data also comes with numerous technical challenges due to sparse data and limited spectroscopic resources, including the identification and classification of supernova using photometry alone. Because of this, we were motivated to create a value-added catalog of over 10,000 photometrically classified supernova-like light curves and candidate host galaxy associations from the Zwicky Transient Facility (a current all-sky survey operating at 1/10th the capacity of Vera Rubin). Our work represents a pathfinder effort to supply massive data sets of supernova light curves with value-added information that can be used to enable population-scale modeling of explosion parameters and investigate host galaxy environments.

Mentor(s):

Danny Milisavljevic (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 139
Presentation Time: Session 1: 9am-10:30am

Effects of dietary protein quantity and source on cardiometabolic disease risk factors in postmenopausal women performing resistance training

Author(s):

Chloe Garrett† (HHS, Honors); Rebecca Lewis* (HHS); Sarah Preston* (HHS, Honors); John Vanos* (HHS); Lucas Stouder* (HHS); Hannah Winstone* (HHS)

Abstract:

We assessed the effects of consuming a U.S.-Style Healthy Dietary Pattern (HDP) with higher protein predominantly from lean beef, compared to a HDP with normal protein or higher protein HDP lower in beef on changes cardiometabolic disease (CMD) risk factors in older women who performed resistance training for 12 weeks. For this investigator-blinded study (Purdue IRB 2019-218), 36 healthy women (age: 66±1 y) were randomized to consume a U.S.-Style HDP with: 1) high-protein emphasizing unprocessed lean beef (HP-Beef, 1.4g/kg body weight/d); 2) HP with mixed protein sources (HP-Mixed); or 3) lower-protein (LP-Mixed, 0.8g protein/kg BW/d). We hypothesized that consuming the HP-Beef HDP would augment improvements in CMD risk factors. Blood samples collected at baseline and intervention week 12 were used to measure plasma total cholesterol (CHOL), low- and high-density lipoproteins (LDL, HDL), triglycerides (TRIG), glucose, insulin, and HBA1c. Over time, HDL decreased (time effect, $p=0.0018$); with multiple comparison testing showing the difference was limited to the HP-Mixed. Consuming a US-style HDP with varied amounts and sources of protein-rich foods did not change or differentially affect the other clinical CMD indicators. In conclusion, contrary to our hypothesis, consuming a HDP, especially with higher protein emphasizing lean beef, for 12 weeks did not influence CMD risk factors in postmenopausal women who concurrently performed resistance training. Still, the Dietary Guidelines for Americans recommends for older women to habitually consume a HDP to promote cardiometabolic health.

Mentor(s):

Chad Carroll (HHS); Wayne Campbell (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 140

Presentation Time: Session 1: 9am-10:30am

Evaluating the Cultural Context of Engineering and Engineering-Related Concept Inventory Assessment Items

Author(s):

Philip Goldberg† (Engineering, Honors)

Abstract:

Assessments are an integral part of education and discussions are prevalent surrounding their fairness, as well as consideration of equity for the testing population from creation through implementation and scoring. There are several factors that impact a student's performance on an assessment, including the context of the question. It is possible for a student to understand a concept, but be distracted by unfamiliar context which takes away from the main learning objective. The purpose of this research is to explore how cultural knowledge is embedded in engineering concept inventories. What sociocultural norms and lived experiences are dominant in the context of concept inventory questions? Nine concept inventories with 258 items were analyzed using qualitative content analysis in subjects including statistics, dynamics, chemistry, thermodynamics, and fluids with initial notes and observations being documented in a spreadsheet. Observations included understanding of presented figures, answer choices, and question wordings. Preliminary results showed that four categories could be grouped for multiple questions in describing existing distractions for individuals answering a concept inventory question. Categories for these conceptual topics were access to technology, cultural sensitivity, insider knowledge, and assumed experiences. Considering universities in the United States educate learners from around the world; it is important that the context of a question is readily understood so that it is not a hindrance in assessing their content knowledge. Concept inventories are created to evaluate conceptual understanding of specific topics, so it is important to recognize how improper contextualization can misconstrue the intended objective of that purpose.

Mentor(s):

Kerrie Douglas (Engineering); Shauna Adams (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 141
Presentation Time: Session 1: 9am-10:30am

The Improvement to Natural Disaster Response in Cities Through Unmanned Aerial Vehicles

Author(s):

Jaya Hari† (Engineering, Honors); Akash Kumar† (Engineering); Sejal Kumar† (Engineering); Vidisha Singhal† (Engineering); Vishal Muthuraja† (Engineering); Tim Chou† (Engineering); Ritvik Gupta† (Science)

Abstract:

Computer vision technologies are the crux of many current breakthroughs in artificial intelligence today such as in autonomous driving. Current solutions include curated datasets of camera-captured images with appropriate annotations and of computer-generated images with accepted characteristics. However these methodologies require immense human effort to provide descriptions of the images, often exclude events such as natural disasters, and are unable to correctly factor in qualities such as gravity or inertia, resulting in expensive physical models being built. Unmanned aerial vehicles (UAVs) with abilities in object recognition in dynamic environments, along with an open-source simulator created to provide a safe, inexpensive, and realistic experimentation environment (using Gazebo and ROS [Robot Operating System]), can be applied in an assortment of scenarios, including in disaster response, decreasing high human involvement in annotation, testing nearly impossible scenarios, and decreasing expenses of physical modeling. To test this solution, a mini city is designed and built to emulate a natural disaster and is additionally implemented in the simulator, a sample solution is formulated using the simulator, and a Mavic Air2 drone—programmed with ROS—is used to test the solution and ensure that the vehicle travels accurately and consistently with reference to the simulator. Future works would suggest alternative models be created with the simulator in order to expand the set of sample solutions to serve in improving the real-time computer vision, navigation, and effective machine learning of UAVs.

Mentor(s):

Yung-Hsiang Lu (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 142
Presentation Time: Session 1: 9am-10:30am

Validating Freezing Level Heights for Lafayette, IN Using Purdue University Weather Balloon Data

Author(s):

Danielle Harr† (Science)

Abstract:

This study aimed to validate the freezing level height data from BUFKIT (a tool that provides vertical atmospheric profile model forecast data for weather station locations throughout the U.S. that do not launch radiosondes) in the Lafayette area using temperature data from 31 radiosondes launched from Purdue’s West Lafayette campus (from 2017 to 2022). In order to do this, BUFKIT freezing level heights in meters were pulled from soundings of the same date and time as that of the West Lafayette data. The data was further split by meteorological season, numerical weather prediction (NWP) model used by BUFKIT, and also by proximity to fronts. From this analysis, it was found that the correlation coefficient for the total data was about 0.96. For the other data sets, the correlation coefficient ran between about 0.85 to 0.97. The highest correlation coefficient was found for the fall months (0.97) and the lowest was for the summer months (0.86). Overall, strong correlation was found between the freezing level heights of BUFKIT and those measured by radiosondes launched from West Lafayette. These findings will aid in interpreting which factors most affect the accuracy of BUFKIT and may also help with determining the uncertainty of freezing level heights in the Purdue XTRRA radar.

Mentor(s):

Robin Tanamachi (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 143
Presentation Time: Session 1: 9am-10:30am

Rapid Diagnostic Auditory Testing with Speed Running Audiograms

Author(s):

Audrey Harrison† (Honors)

Abstract:

Standard audiogram tests require two hours on average to test sensory hearing perception. Shorter test durations will allow for rapid testing. We predict that generating an interleaved rapid tone pip stimulus, a piptrain, will allow for rapid identification of threshold values for multiple frequencies. Two piptrains have been generated. For each of them, 4 frequencies spanning 4 octaves are used. The four frequencies have minimal spectral overlap; 1000, 9500, 4000, and 16000 Hz, are played as tone bursts. Additionally, a high frequency version of the stimulus is generated, and includes 2000, 19000, 8000, and 32000 Hz. Altogether, each stimulus version requires approximately 2 minutes to gather data across four frequencies. Auditory evoked potentials generated were individually compared to the standard 8000 Hz audiogram for each subject. A pre-stimulus noise floor is established and peaks three standard deviations away are indicated as larger than the noise baseline. At 80 decibel (dB) neural response remains above the noise floor with slight adaptation between waves. At 20 and 30 dB sensation level (SL) above threshold the electrophysiological response has lost differentiation between the noise floor. This was most noticeable in frequencies 1000, 2000, and 32000. Overall, the piptrain response displays a degraded auditory brainstem response morphology in later waves as well as neural adaptation between frequency shifts. Our results indicate the stimulus is effective as a method for an electrophysiological threshold. This will allow for faster identification of threshold changes across frequencies within human field work.

Keywords

Interleaved Rapid Tone Pips, Auditory Evoked Potential, Neural Adaptation Electrophysiological Threshold

Mentor(s):

Edward Bartlett (Engineering); Meredith Ziliak (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 144
Presentation Time: Session 1: 9am-10:30am

Printing with Hybrid Continuous and Discontinuous Fiber Reinforced Thermoplastics

Author(s):

Cameron Hartsfield† (Engineering); Pattiya Pibulchinda* (Engineering); Andrew Bruns* (Engineering)

Abstract:

The addition of short carbon fibers to printing thermoplastics and the enhancements to large scale Additive Manufacturing (AM) systems have enabled printing parts in the multi-meter scale. Carbon fibers reduce the coefficient of thermal expansion of the printing material in the direction of dominant fiber alignment, however, the short fiber length limits the usage of the strength characteristics that carbon fiber can provide. Hence, a process for printing with a hybrid of continuous and discontinuous fibers was developed at the Composites Manufacturing and Simulation Center (CMSC) to enhance the structural characteristics of printed materials. The continuous fiber provides exceptional mechanical properties, and the discontinuous fiber provides the flexibility critical to the 3D printing process with a penalty in strength. This work provides an initial demonstration of the potential enhancements in strength that result from incorporating the continuous fiber compared to a traditional discontinuous fiber print. The enhancement to the strength characteristics was demonstrated through tensile tests of specimens fabricated with the hybrid system. The continuous fiber and short fiber pellets were pre-impregnated with polyphenylene sulfide (PPS). The hybrid 3D printing process was demonstrated on CMSC’s Composites Additive Manufacturing Research Instrument (CAMRI). The CAMRI is a 3D printer that is designed to print discontinuous fiber parts and was augmented with a coextrusion nozzle and a continuous fiber feeding system for this study. The initial results presented in this work showed an increase of about 30% in the tensile strength by reinforcing the coupon with continuous fiber.

Mentor(s):

Eduardo Barocio (Purdue University); Garam Kim (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 145

Presentation Time: Session 1: 9am-10:30am

Modelling the Role of MicroRNAs in a Rare Vascular Cancer

Author(s):

Samuel Hartzler† (Science)

Abstract:

Epithelioid hemangioendothelioma (EHE) is an ultrarare vascular cancer with a poor prognosis. Previous studies have identified chromosomal translocations and the abnormal transcription factor fusions TAZ-CAMTA1 and YAP1-TFE3 as driver mutations of EHE. Much of the previous work on EHE has focused on the downstream coding genes regulated by the hyperactive TAZ/YAP fusion proteins, and few studies have addressed the dysregulation of noncoding genes such as microRNAs. MicroRNAs are small noncoding RNAs which regulate gene expression and are often involved in cancer-associated pathways. MicroRNAs therefore provide important biological contributions to cancer and could themselves be potential therapeutic targets for EHE. We generated mouse and human endothelial cell lines expressing the fusion constructs in a doxycycline-inducible manner. We confirmed functional expression of the fusion proteins using qRT-PCR, immunoblots, and immunofluorescence. Small RNA sequencing identified several microRNAs significantly dysregulated upon expression of the fusion proteins. These results validate our cellular model and identify targets for further investigation. Future directions for this project will include microRNA gain-and-loss of function experiments of these candidate microRNAs to determine what interactions are driving the emergence of the cancer phenotype. These results will contribute to the increased understanding of the molecular pathways in this cancer and the development of better therapeutic treatments for EHE.

Mentor(s):

Jason Hanna (Science); Anthony Murphy (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 146
Presentation Time: Session 1: 9am-10:30am

Applying Convolutional Neural Networks to Increase Classification Precision of XENONnT Data

Author(s):

Travis Hastreiter† (Engineering); Eleazar Gonzalez† (Science); Zack Balbo† (Science); Connor Barnsley† (Science)

Abstract:

The universe is 85% dark matter. Scientists have been looking for evidence of its existence for decades through numerous experiments and projects. XENONnT is a dark matter detector that uses liquid and gaseous xenon to detect the interactions between dark matter and normal matter. XENONnT detects two types of interactions: electronic recoil and nuclear recoil interactions. Electronic recoil (ER) happens when beta and gamma rays interact with electrons of xenon atoms. Nuclear recoil (NR) happens when neutrons or possibly dark matter interacts with the xenon nuclei. ER is the background for the XENONnT so methods to classify an interaction as NR with a high degree of precision are crucial to the search for evidence for dark matter. Current methods have a NR acceptance of 50% with a precision of 99.7%. Our research focuses on developing a machine learning model that will discriminate between NR and ER interactions with a greater precision and acceptance than current methods. To accomplish this, our model takes in the raw output from the detectors as input instead of giving the model preprocessed data that most current models use, hopefully making use of the information lost due to processing.

Mentor(s):

Rafael Lang (Science); Riya Singh (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 147
Presentation Time: Session 1: 9am-10:30am

Optimization of Soldering Alloy Experimentation through Machine Learning

Author(s):

Jorge Hernandez† (Engineering); Varun Vaidyanathan† (Engineering, Honors); Kathleen O'Sullivan† (Engineering)

Abstract:

Our research primarily focuses on the optimization of lead-free soldering alloys, specifically those of high-entropy, using machine learning techniques. We have sought out to examine the properties of various high-entropy alloys and find the best combination of alloy compositions that can provide desirable properties for soldering applications while remaining cost-effective. Collaborative coding networks like Nanohub were used to run simulations that analyzed the properties of different alloys. Our code was also updated to include not only the best combinations of an alloy's compositions but the price of the alloy as well.

Although our research is still ongoing, initial findings suggest that machine learning is a promising tool for predicting the properties of these soldering alloys. Once we gather more data, we anticipate acquiring results similar to others that have conducted physical experiments on high-entropy alloys, thus proving machine learning's reliability. By reducing the environmental impact of lead-based soldering alloys while still taking into consideration their quality, this study can have important implications for the electronics industry. The hopes of this research are for it to contribute to the development of more sustainable and efficient soldering techniques in the future.

Mentor(s):

Brian Lee (Engineering); Brian Lee (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 148
Presentation Time: Session 1: 9am-10:30am

A Novel Binder Protein Targeting the SARS-CoV-2 Spike Protein Using FoldIt

Author(s):

Sabrina Hinojosa† (Science, Honors)

Abstract:

In light of the 2020 COVID-19 pandemic, the world has needed to respond to this global challenge by developing new strategies to prevent viral infection. One approach to this problem is by allowing citizen scientists to design novel protein binders using the online game FoldIt. The development of a small synthetic binder protein proves to be a viable solution for stopping viral infection as they are more cost effective, stable, and can be aerosolized into the nose, unlike antibody application. In FoldIt's Coronavirus puzzle, players are challenged to design a protein that can stably bind to the receptor binding domain (RBD) of the SARS-CoV-2's spike protein, blocking viral infection by competing with human ACE2 cell receptors. Here, a small novel inhibitory protein is described that incorporates two alpha helices and a beta sheet. The proposed structure optimizes stability and binding affinity by incorporating a strong hydrophobic core and creating hydrogen bonding at key residues at the RBD-ACE2 interface Stability of the binder protein will be evaluated by the following metrics: binding energy, contact surface area, and unsatisfied polar atoms. Unlike automated computational protein design methods, the current research utilizes a combination of human ingenuity and sophisticated algorithms to accurately design a successful binder protein as well as contribute to the scientific community with the development of a novel protein design.

Mentor(s):

Zahra Tehrani (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 149
Presentation Time: Session 1: 9am-10:30am

Plant Identification

Author(s):

Joseph Huang† (Engineering); Andrew Hufford† (Engineering); Kaleb Lee† (Engineering); Aditya Sinha† (Engineering); Tanishaa Shah† (Engineering)

Abstract:

The purpose of this project is to create an app that is able to recognize different types of plants. Our team created an Android app that prompts the user to take a picture of a plant. After the image is taken, it is sent to a server where the image is processed on our algorithm and the type of plant is sent back to the app to be displayed to the user. We have two sub-team working on this project: the algorithm team and app team.

The algorithm team is developing the process that will identify the uploaded plant images. The algorithm we will implement is called Faster R-CNN. We intend to detect the plant's region in the image with a region proposal network. We will subsequently implement feature identification via a convolutional neural network to produce the flower's name as the final result. To begin, we have constructed an image library of five species of plants to train and test our algorithm.

The app team is working on building the user interface of the application. The application has a camera function built in which allows the user to take an image of the plant in the app. The image is then uploaded to a server using volley. The server uses php to look for requests to process images. Once the server finds the request, it runs the algorithm on the uploaded image and sends the result of the algorithm back to the app.

Mentor(s):

Edward Delp (Engineering); Carla Zoltowski (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 150

Presentation Time: Session 1: 9am-10:30am

Is there a correlation between stomatal plasticity and environmental aridity in Arabidopsis thaliana ecotypes?

Author(s):

Clare Hughes† (Agriculture)

Abstract:

Plant species and populations adapt to better perform in their environment, and one adaptable factor that affects performance is plasticity. Plasticity describes the ability of an organism to alter its anatomy and/or morphology in response to changes in environmental conditions. The purpose of this study was to determine the linkage, if any, between the stomatal plasticity of Arabidopsis ecotypes and the aridity of their native environment. Stomatal cells, while necessary for gas exchange, are sites of evapotranspiration. High levels of evapotranspiration increase the harmful effects of water stress, so it was my hypothesis that Arabidopsis ecotypes from high-aridity environments will display high levels of stomatal plasticity between well-watered (WW) and water-stress (WS) conditions. To test my hypothesis, I used ImageJ to measure stomata cells of plants grown in either WW or WS conditions. I then calculated the average stomata area and stomatal pore index of each ecotype treatment and compared this data with the aridity index of their native environment. My analysis showed clear stomatal plasticity to changes in water conditions in some Arabidopsis ecotypes. However, there was no strong correlation between stomatal plasticity and the aridity of an ecotype's natural environment. This result suggests that traits besides stomatal plasticity could be relevant to a plant's fitness in a high-aridity environment. In addition, other environmental aspects, such as light or salt content, may have an effect on stomatal plasticity.

Mentor(s):

Michael Mickelbart (Agriculture); Santiago Franco Lopez (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 151
Presentation Time: Session 1: 9am-10:30am

A Comparison of Histidine Triad Proteins (HIT) and their Functions in Cluster C1 Mycobacteriophage SrishMeg2525 to HIT in Eukaryotes and Prokaryotes

Author(s):

William Humble† (Engineering, Honors); Rachael Paston - Amos† (Engineering); Joel Kuriakose† (Engineering, Honors); Avery Willson† (Science); Chandni Garg† (Science); Lekha Durai† (Engineering, Honors); Sophia Remmey† (Agriculture); Lukas Sizemore† (Agriculture); Alekhya Ankaraju† (Agriculture); Youssef Morad† (Pharmacy)

Abstract:

The purpose of this work is to identify and characterize genes on the bacteriophage SrishMeg2525 that encode histidine triad proteins (HIT). Bacteriophages are viruses that infect and replicate within bacteria. SrishMeg2525 was discovered through isolation from a soil sample, purification, amplification, and sequencing. The sequenced genome was then annotated through a variety of software such as DNA Master, HHPred, Phamerator, NCBI Blast, Starterator, PhagesDB, GeneMark, SEA-PHAGES Guide, etc. that aid in assessing the strength of similarities across genomes. HITs are part of a protein group called nucleotide hydrolases, which break DNA and RNA into their component parts and are important for biochemical pathways. Their role in bacteriophages is not well-studied yet, but by comparing the structure of HIT proteins in SrishMeg2525 to highly similar HIT proteins with known functions, a hypothesis for their role can be formed about HIT in phages. If gene 18 on SrishMeg2525 is similar to other genes that encode HIT, then it is theorized that the draft gene on SrishMeg2525 exists and functions the same way. Previous research studied correlations between characteristics of specific HIT proteins and viral infectious capabilities. Thus, high structural similarity might indicate shared function for the protein in bacteriophages. While these HIT proteins are well-documented in eukaryotes and other prokaryotes, there is room to explore their role in phages, and the identification and increased understanding of these genes in phages would be a novel discovery.

Mentor(s):

Kari Clase (Agriculture); Adam Quinn (Agriculture); Anjana Narayanan (HHS); Arya Shembekar (Science); Daphne Fauber (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 152
Presentation Time: Session 1: 9am-10:30am

An inducible in vitro system to reprogram somatic cells into a gamete fate

Author(s):

Keila Jellings† (Agriculture)

Abstract:

Fertilization is a critical biological process for species survival and genetic diversity. In plants, seeds are the direct products of double fertilization and are the basis of nearly all our food. Despite its importance in agriculture, little is known about the processes that lead to fertilization success and the communication between plant male and female gametes. Because fertilization occurs deep into the flower tissues and involves just a few cells in the plant, studying sperm-egg interactions is technically challenging. To overcome these difficulties, we established an estradiol-inducible system in Arabidopsis thaliana to test the potential to reprogram somatic leaf cells into gametes. Inducible UBQ10p:RKD2-GFP and UBQ10p:DUO1-mCherry, master regulators of sperm-egg cell identity, were introduced into the background of several transgenic lines that express egg and sperm cell-specific markers. Protoplasts isolated from four to six-week-old rosette leaves were monitored using fluorescence microscopy for nuclear expression of RKD2-mCherry and DUO1-GFP following induction by β-estradiol. In addition, we verified the expression of plasma membrane gamete-specific markers to validate a shift from somatic to sperm or egg-like state. We will report our preliminary findings on the ability of this system to reprogram somatic cells into sperm and egg cell fate. If successful, this novel in vitro "artificial gamete" platform can facilitate the study of protein-protein interactions occurring at the cell surface of gametes and ultimately lead to a better understanding of how fertilization and seed development are regulated in plants.

Mentor(s):

Leonor Boavida (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 153
Presentation Time: Session 1: 9am-10:30am

Considering Rebound and Feedback Effects in Analyses of the Inflation Reduction Act

Author(s):

Haseung Jun† (Engineering, Liberal Arts, Honors)

Abstract:

In August 2022, the US Congress passed the Inflation Reduction Act (IRA). Some have claimed that this was the single largest action ever taken by Congress to combat climate change. The act aims to reduce US carbon emissions and combat record-high levels of inflation. According to a prominent analysis of the bill, conducted by the Rhodium Group, the IRA will reduce carbon emissions by 32-42% from 2005 levels by 2030 and reduce household energy cost by $112 per household in 2030.

Increased efficiency can cause feedback effects such as increased usage due to economic savings (rebound effects). The objective of this study is to understand if feedback loops and rebound effects of the economy were taken into consideration in the Rhodium Group's analysis of the potential emissions reductions of the IRA. With intensive research and qualitative analysis, it was found that the Rhodium Group used databases such as the Climate Deck and National Energy Modeling System to make their predictions about the IRA's effects. The Rhodium Group, when making their analysis, may not have considered feedback loops or rebound effects when doing their calculations, potentially putting the analysis at risk of miscommunicating the ability of the IRA to combat climate change. Despite positive outlooks for the future with this bill, the future may not be as optimistic. However, the research reminds the public that more progress must be made to truly combat climate change.

Mentor(s):

John Mulrow (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 154
Presentation Time: Session 1: 9am-10:30am

Determination of MLO3 Localization and Effect on the Endodermis

Author(s):

Ethan Kaser† (Agriculture)

Abstract:

The Mildew Resistance Locus O (MLO) protein family has been implicated in many processes within plants, including powdery mildew susceptibility, reproduction, and root tropism. However, their function as a calcium ion channel was unknown until recently. MLO3 is primarily expressed within the endodermis of the root of plants, with mutants having an increased amount of callose in the leavesi. We want to further characterize the mlo3 mutants to determine whether the casparian strip is altered by staining with phloroglucinol. Determining if the casparian strip is altered would mean that ions and water influx could be affected. We also aim to determine whether the amount of calcium is reduced in the entire plant, leading to increased callose in the leavesii. On a cellular level, we will also attempt to identify the subcellular localization of MLO3-GFP as it is currently unknown.

Mentor(s):

Sharon Kessler (Agriculture); Sienna Ogawa (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 155

Presentation Time: Session 1: 9am-10:30am

Changes in Physical Activity After A Matter of Balance: A Preliminary Analysis

Author(s):

Reese Kerschner† (HHS)

Abstract:

Background: More people stay or become physically inactive as they age. This is an important issue because benefits of physical activity (PA) are short-lived. The purposes of this study were to explore changes in PA over time, and inspect potential association between PA and potential correlates of PA (satisfaction with PA, social support for PA, and concerns about falling) among people who completed A Matter of Balance, an evidence-based program that focuses on reducing fear of falling and increasing PA. Methods: Seventeen White females aged ≥ 55 years [Mage = 73.8 years; 57 to 87 years] filled out a postal mail survey, and wore an ActiGraph wGT3X-BT accelerometer for seven consecutive days, once a month for nine months beyond program completion. Results: To explore changes over time, we created a time plot for PA (steps/day and frequency of PA) and its potential correlates. PA fluctuated (increased or decreased) over time; however, frequency of moderate to vigorous intensity PA remained low and unchanged. Satisfaction with PA and social support for PA were mostly favorable, and either fluctuated or remained unchanged. Concerns about falling remained low and unchanged. To explore associations between PA and the potential correlates, we computed Spearman's rank order correlations at each time point. Satisfaction with PA was the only factor that tended to be positively linked to PA. Conclusion: PA tends to change over time. Whether people's satisfaction with PA is generally high/low or varies across time should be considered in future studies of PA change and maintenance.

Mentor(s):

Steve Amireault (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 156
Presentation Time: Session 1: 9am-10:30am

Soil pore water chemistry dynamics in prairie and agricultural sites

Author(s):

Bethany Kettleborough† (Science); Yulei Yang‡ (Science, Honors)

Abstract:

Soil water plays an important role in vegetation health and soil geochemical reactions that influence stream chemistry. Water movement within soil, which can include vertical infiltration and evaporation, can be investigated using differences in stable water isotope contents, such as oxygen-18 and deuterium. Water dynamics can lead to differences in soil weathering, depending on the type of soil and land management. The purpose of this study was to analyze the relationships between stable isotope and ion concentrations at varying depths in prairie and agricultural land management in Illinois and Nebraska. Prairie sites include deep-rooted plants such as bluestem, while agricultural sites include shallower-rooted row crops. Using soil pore water samples collected from lysimeters at various depths at these sites, we analyzed the samples for stable isotopes concentrations. Ion concentrations (cation and anion) were measured at the UIUC. Ion analysis from previous years has shown that agricultural sites in Nebraska contain higher concentrations of Mg^{2+}, Ca^{2+}, Na^+, and K^+ ions than prairie sites, whereas agricultural sites in Iowa contain higher concentrations of Mg^{2+} and Ca^{2+} ions than prairie sites, while the prairie sites contain similar concentrations of Na^+ and K^+ ions as the agricultural sites (Dere et al., 2019). We hypothesize that ion concentrations may be sensitive to precipitation event infiltration depths or evapoconcentration, which also leave signals in the water stable isotope values of the soil pore waters. Results of this work-in-progress will be shared.

Mentor(s):

Dr. Lisa Welp (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 157
Presentation Time: Session 1: 9am-10:30am

In silico Screening and Design of a SMARCC2 Ligand

Author(s):

Sam King† (Pharmacy)

Abstract:

SMARCC2, a scaffolding protein subunit for mSWI/SNF chromatin remodelers, has been implicated in prostate cancer drug resistance by facilitating neuroendocrine differentiation. Therefore, developing a small molecule inhibitor will serve as a potential therapy for prostate cancer patients, after the failure of first-line hormonal treatments. SMARCC1, a paralogue of SMARCC2 with 68% sequence homology, recently had its N-terminus domain crystallized. Using a variety of programs including Alpha Fold, Maestro, and PHYRE2, we have created a sequence-derived homology model of SMARCC2. ZINC20, a virtual ligand library with over one billion unique structures, allows pre-screening for Pan-assay interference compounds (PAINS) and other “hot” compounds. Using Maestro’s Glide high throughput screening, we have identified a number of hit compounds to now test experimentally in vitro. Furthermore, tools such as pharmacophore modeling have allowed us to build a number of molecules with promising docking scores. This project sets the stage for the next step of an assay-based screening of hit compounds.

Mentor(s):

Emily Dykhuizen (Pharmacy); Surbhi Sood (Pharmacy); Sandra Ordonez (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 158
Presentation Time: Session 1: 9am-10:30am

Exploring In-silico Primer Design for Biochemical Reactions

Author(s):

Connor Klaassen† (Science, Honors)

Abstract:

The aim of this literature review was to understand the current state of research on the in-silico design of primers for biochemical reactions. The review focused on three main publications collected from peer reviewed journals, all of which concern PCR, a commonly used DNA amplification technique. There are two main approaches presented in these papers. The first approach is a MapReduce model that takes in both a DNA sequence database and related filtering characteristics, producing valid primer pairs within the specified database. Such a model operates by filtering out unsuitable primer pairs within structured steps, operating on smaller amounts of data as the algorithm progresses. This is described in two papers, with the first highlighting a general MapReduce framework to generate such primers [1], and the second discussing a GPU acceleration of the model [2] presented in the first. The second approach, on the other hand, is a stochastic model that characterizes potential primer sets based on the impact of primer dimer formation on a given primer set [3]. These publications provide valuable information and approaches that can be utilized to develop a comprehensive model for in-silico primer design for various biochemical reactions. The literature review determined that a MapReduce model is the most applicable for generalization across various biochemical reactions, as a stochastic approach requires the definition of a mathematical ranking equation for the given reaction. By advancing in-silico primer design methods, future research in this field could lead to the development of more efficient and comprehensive methods, contributing to the use of less-utilized amplification techniques.

1. Kim, Hyerin, et al. “Mrprimer: A Mapreduce-Based Method for the Thorough Design of Valid and Ranked Primers for PCR.” Nucleic Acids Research, vol. 43, no. 20, 2015, https://doi.org/10.1093/nar/gkv632.

2. Bae, Jeongmin, et al. “GPRIMER: A Fast GPU-Based Pipeline for Primer Design for QPCR Experiments.” BMC Bioinformatics, vol. 22, no. 1, 2021, https://doi.org/10.1186/s12859-021-04133-4.

3. Xie, Nina G., et al. “Designing Highly Multiplex PCR Primer Sets with Simulated Annealing Design Using Dimer Likelihood Estimation (Saddle).” Nature Communications, vol. 13, no. 1, 2022, https://doi.org/10.1038/s41467-022-29500-4.

Mentor(s):

Mohit Verma (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 159
Presentation Time: Session 1: 9am-10:30am

Self-reported Health Concerns Among Adults in Hartford City, IN

Author(s):

Sharon Kulali† (Agriculture, HHS, Honors); Rebecca Eyrick† (HHS); Perry Curtis* (HHS); Hannah Bard* (HHS)

Abstract:

Metal recycling plants may release environmental contaminants (air pollutants and heavy metals) into nearby communities. The citizens of Hartford City raised concerns about a local metal recycling plant and a variety of health concerns. As a first step to address these concerns, the goal for this analysis was to evaluate self-reported health indicators in adults from Hartford City. We completed a cross-sectional study of Hartford City adults (≥18 years old) in 2022. Participants completed a questionnaire regarding their demographic characteristics and health status and concerns. Data was available for 283 participants. Stata 17.0 was used to perform statistical analyses. The majority of participants were female (61.8%), White (96.1%), not Hispanic or Latino (98.6%), married (52.1%), and had an Associate's degree (44.0%). Their mean age was 56 years (SEM: 1.1) Most participants indicated that their mental (91.2%) and physical health (80.6%) were "about the same" or "better" in the past 12 months. 22.8% of participants indicated that had had at least one cancer in their lifetime, 47.3% had been diagnosed with hypertension, 42.8% had allergies, and 42.0% had high cholesterol. The highest concerns for citizens of Hartford City were cancer (29.3%), drug use (27.9%), and water quality (20.1%). Other highlighted concerns were air quality, soil quality, poverty, and obesity. Additional analyses to determine correlations of demographic characteristics with health outcomes are ongoing. These results contribute to our understanding of the health concerns among Hartford City adults.

Mentor(s):

Ellen Wells (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 160
Presentation Time: Session 1: 9am-10:30am

Effects of Tetrachloroethylene Exposure on Children’s Neurobehavioral Performance in Martinsville, IN

Author(s):

Ian Kurz† (HHS); Brandon Tso* (HHS); Abigail Valdez* (HHS)

Abstract:

This study aims to quantify the effect of volatile organic compounds (VOCs) on the development of children, an at-risk group to exposure of neurotoxic VOCs like tetrachloroethylene (PCE) due to ongoing cognitive development. PCE enters the water table through improper disposal, which leads to exposure due to vapor intrusion and contaminated water consumption. The area of interest for this study was Martinsville, IN, which has overlaid an EPA Superfund site for a PCE groundwater plume since 2002. Children living here were expected to have long term chronic exposure to PCE as a result. PCE exposure of 73 participants, ages 6-11, was tested through Proton Transfer Reaction – Mass Spectrometry of exhaled breath in a mobile lab, a novel use of the technology. Cognitive development was assessed using 3 behavioral and cognitive tests: the NIH Toolbox (NIH), the Behavior Assessment System for Children (BASC-3), and the Wide Range Achievement Test (WRAT-5). These test for reading, spelling, math, and general cognitive and emotional development. We found a negative correlation between PCE in exhaled breath and performance on 12 out of 13 test composites, the associations between the exposure and 3 of 4 NIH Toolbox and 3 of 5 WRAT-5 composite scores being statistically significant (p<0.05). This data supports that PCE exposure hinders neurobehavioral performance, underscoring the need to limit exposure to the compound among children. Future research will evaluate the risks of specific concentrations of PCE to inform public health on best practices.

Mentor(s):

Sa Liu (HHS); Marwan Alajlouni (HHS); Jung Hyun Lee (HHS); Alaina Bryant (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 161
Presentation Time: Session 1: 9am-10:30am

Characterization of radiation resistance in silicone rubber with added methyl-phenyl polymer for application in Large Hadron Collider (LHC) upgrade for CMS, CERN.

Author(s):

Hannyi Lee† (Engineering)

Abstract:

Radiation-resistant materials are essential in various industries, particularly in aerospace and nuclear applications. The high luminosity upgrade of the LHC will collide particles at unprecedented instantaneous luminosities in search of new physics posing high demand on the support structures for the detectors. The accumulated radiation dose is expected to reach up to 100kGy for the composite detector structures being built at the Composite Manufacturing and Simulation Center at Purdue University. These will have a silicone rubber based air seal at the interface to ensure a hermetic seal in the inner and outer detector volumes. The seal is expected to withstand 4 Pa pressure and maintain its mechanical properties under the harsh radiation environment. This study proposes various characterization techniques for storage and loss modulus and flexural modulus measurement before and after irradiation. Silicone rubbers and carbon composite structural materials were tested with a dynamic mechanical analyzer. In search for a radiation-resistant sealing rubber, an attempt was made to reinforce the known stable silicone rubber with an additive. In this study, we investigated the effects of adding methyl phenyl polymer (MPP) to platinum-cured silicone rubber (PCSR) on its radiation resistance. PCSR samples with varying MPP concentrations were exposed to Co-60 gamma radiation at doses of 100 kGy. The proposed choice of material is used for prototyping the silicone seal and results are presented from the same.

Mentor(s):

Ben Denos (Engineering); Sushrut Karmarkar (Engineering); Andreas Jung (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 162
Presentation Time: Session 1: 9am-10:30am

Investigating Elementary Teachers' Use of Mathematics Curriculum Materials

Author(s):

Jueqing Li† (Education)

Abstract:

Investigating Elementary Teachers' Use of Mathematics Curriculum Materials is a collaborative research project across four universities. The primary goal of the project is to explore teachers' use of mathematics curricular materials in the context of the proliferation of online resources and the COVID-19 pandemic, with a focus on curricular coherence, teacher autonomy, and the use of teacher-developed curriculum from sites such as Teachers-Pay-Teachers and Pinterest. We used individual and focus group teacher interviews at several schools representing diverse curricular contexts to explore both the quantitative and qualitative aspects of the teachers' mathematics curricular decision making. Preliminary findings indicate teachers' use of multiple (as many as 14) mathematics curricular resources to provide rigorous and engaging mathematical experiences for their students, including (a) traditional online textbook resources (e.g., enVision); (b) supplementary applications (e.g., BrainPOP); (c) assessment resources (e.g., Edulastic); (d) online lessons created by teachers (e.g., Teachers Pay Teachers); and (e) self-created teacher materials. I am currently engaged in a sub-study analysis of this project based on interviews with three of the teachers in which we compiled the rationale (i.e., why) and strategies (i.e., how) for teachers' use of these curricular materials. Findings from this study highlight the complex curriculum work enacted by elementary teachers as well as the need for teacher support to assist in the navigation of mathematics curricular resources. They also have the potential to provide valuable insights for curriculum designers for possible modifications based on the teacher feedback.

Mentor(s):

Jill Newton (Education); Doris Fulwider (Education)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 163
Presentation Time: Session 1: 9am-10:30am

Should policymakers enforce stricter laws against driving under the influence (DUI)?

Author(s):

Jia Le Lim† (Liberal Arts)

Abstract:

How often do we see a DUI-related traffic road accident on the news? Numbers might be more than you think. It is well-understood that DUI is an act that could be punishment for a misdemeanor or a felony based on the accident's severity. DUI is also known as driving under the influence, and many offenders still ignore the consequences of drunk driving to this day. This study investigates the effects of DUI and the potential ways of reducing them by enforcing stricter laws against drunk driving. To achieve this objective, multiple research articles were analyzed and used to present the argument on this topic. Findings show that alcohol is involved in almost 32% of all fatal accidents in the United States each year; alcohol stimulates drivers to increase their speed on the roadway, and enforcing stricter laws can reduce the number of DUI cases as long as the certainty of the punishment is ensured and protected. The issue of DUI remains today, and multiple efforts are required to protect our safety on the road.

Mentor(s):

Qian Wang (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 164
Presentation Time: Session 1: 9am-10:30am

Relationship between Loma Oases in the desert and the Pleistocene settlement of South America

Author(s):

Hannah Lipps† (Liberal Arts)

Abstract:

Lomas oases are ecosystems that form along the Peruvian coast due to the dense winter fog that forms on the foothills of the Andes mountains. As a result of their formation processes, Lomas are home to various plant and animal species. Andean archaeologist, Frédéric Engel hypothesized that the Lomas ecosystems were essential for the settlement and subsistence of humans living in Peru during the Pleistocene-Holocene transition. He predicted that if Lomas were vital to the livelihoods of people living on the Peruvian coast, then archaeological remains of their prehistoric settlements would be located within the extent of prehistoric Lomas. Recent research supports this hypothesis, though limited data are available. Building on this hypothesis, I used Geographic Information Systems and statistical inference to evaluate the relationship between archeological sites and Loma location. First, I digitized a set of maps Engel created, including site locations in Ica, Peru, and georeferenced the site locations therein. I then conducted a systematic literature review to understand how Lomas form and to identify the climatic variables most important for Lomas formation. I also searched for publicly available climate datasets. I used the climate datasets to create a model to predict the locations of modern and prehistoric Lomas. With these locations, I was able to establish the relationship between the location of Lomas and archeological sites. The results of this research provide insight into how the prehistoric populations of the Peruvian coast chose their settlements and interacted with their environment.

Mentor(s):

Erik Otarola-Castillo (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 165
Presentation Time: Session 1: 9am-10:30am

Compact Control System for Superconducting Qubits

Author(s):

Santiago Lopez† (Science, Honors)

Abstract:

Superconducting qubits are promising for realizing quantum computers with their long coherence times and highly tunable interactions. One important aspect of qubit control is the ability to dynamically control the qubit's frequency through flux-bias pulses to enable fast gate operations and high-fidelity qubit readout. So, there is a need to generate high-bandwidth low-noise arbitrary flux-bias pulses in the frequency range of DC to a few GHz. In previous work, we utilized the Quantum Instrumentation Control Kit (QICK) to run single qubit characterization experiments, optimize the readout fidelity, and compare its performance against current qubit control systems. In this work, we plan to use a new breakout board with increased functionality and extend the previous software to set up scalable flux control. We hope to run multi-qubit experiments using fast flux control and implement single and two-qubit gates. In doing so we will be able to measure gate fidelities and optimize them with similar methods used in characterizing a single qubit.

Mentor(s):

Alex Ruichao Ma (Science); Botao Du (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 166
Presentation Time: Session 1: 9am-10:30am

Drone Video

Author(s):

Ethan Lu† (Engineering); Jinen Setpal† (Science); Colby Acton† (Engineering); Enze Jiang† (Engineering); Vinay Jagan† (Engineering); Riya Varshney† (Engineering); Troy Madden‡ (Engineering); Yunhao Lan‡ (Engineering); Harsh Ajwani‡ (Engineering); Aaron Fritz‡ (Engineering)

Abstract:

Advances in autonomous drone technology have established a precedent for human-machine teaming across ranging scenarios within search and rescue operations as well as structural analysis and disaster relief. The 2023 UAV Chase Challenge aims to explore and evaluate training approaches on a suite of tools designed to simulate vision-based autonomous control systems in real-world scenarios. In addition to accelerating the process of testing and development, these tools provide opportunities to develop more advanced systems within the research domain. Our work proposes developments in the following domains: a) hybrid object detection and tracking for quicker inferencing, b) refined path planning and c) a unified training paradigm leveraging adversarial reinforcement learning. In this work, we propose refined control methods to enable a drone to autonomously follow a rover through a model city, the effectiveness of which is graded using the average distance between the drone and the rover. Our object tracking approach uses onboard depth and RGB sensors to approximate the 3D position of the rover, after which flight logic is employed to follow it. Leveraging Gazebo's robust simulation environment, we develop a gym within which we adversarially train two neural networks competing to either maximize (rover agent) or minimize (drone agent) the average distance of the two vehicles in synthetically generated model cities, allowing exhaustive scenario coverage without expensive data collection. The objective is to enable both agents to discover approaches that enable the catch and run models for the drone and the rover to maintain effectiveness in increasingly difficult scenarios.

Mentor(s):

Wei Zakharov (Libraries); Qiang Qiu (Engineering); Zichen Miao (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 167
Presentation Time: Session 1: 9am-10:30am

Machine Learning for Lab Safety and Internet of Things

Author(s):

Luke Luschwitz† (Science)

Abstract:

The purpose of this project is to reduce the safety risk of working in a lab environment. Lab facilities are where cutting edge research and progress is made, but unfortunately these are often dangerous spaces. Our project seeks to reduce lab safety risks with a machine learning model that predicts unsafe conditions. The machine learning model will be stored on a microcontroller that can be placed around the lab and perform real time environmental analysis. The microcontroller will have sensors measuring data points such as humidity, temperature, CO2, particles in the air, and light.

This branch of the project is only focused on the machine learning side of the solution, so we will not be addressing the hardware or software aspects of the project. The machine learning team is studying the problem space, considering the necessary data to collect, and selecting the best machine learning model. We are carefully testing multiple different machine learning models, and potentially intending to implement different models for different lab environments. We are confident that this project can improve the lives of many researchers on campus.

Mentor(s):

Matthew Swabey (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 168
Presentation Time: Session 1: 9am-10:30am

Applications of Neuropixels

Author(s):

Arth Maindarkar† (Liberal Arts, Science, Honors)

Abstract:

The research questions focus on if there are differences in Medium Spiny Neurons (MSNs) in healthy and autistic mice, as well as the role mixed models play in generating robust analysis. To address these questions, we are implanting Neuropixels probes into the brain of live mice and recording their neuronal activity. In addition to the main research question, the project is designed to broadly explain the technology behind Neuropixels, as well as the impact it has had in the field of neuroscience and the impact it is projected to have in the future.

Mentor(s):

Yang Yang (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 169
Presentation Time: Session 1: 9am-10:30am

Foreign Travel in Contemporary Bollywood Films

Author(s):

Pulkit Manchanda† (Liberal Arts, Honors); Maesa Ogas* (Honors)

Abstract:

This project is driven by the following questions: how does foreign travel (outside India) in Bollywood films transform the film protagonists, and how is this transformation depicted on-screen? In the wake of neoliberalism, foreign travel became a pathway to self-discovery. Historically, Bollywood filmography has always utilized foreign travel however, the meaning of foreign travel as a cinematic device has evolved over 3 temporal phases: before liberalization (post-Independence 1950s to 1992), post-liberalization (1990s to early 2000s), and neoliberal after-effects of liberalization (post-2010). We ‘code’ 10 films released after 2010 and analyze the way foreign travel is depicted in these films while also reflecting on the changing social, cultural, and economic trends in contemporary. Ultimately, the research contributes to a deeper understanding of the role of travel and neoliberal consumerism in the transformation of characters and narratives in Bollywood films.

Mentor(s):

Megha Anwer (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 170
Presentation Time: Session 1: 9am-10:30am

De Novo Design of a SARS-CoV-2 Spike RBD Binder Protein Using Foldit

Author(s):

Gabriel Mason† (Liberal Arts, Science, Honors)

Abstract:

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infects cells by binding to the ACE2 receptor located in the membrane of various cell types. Antibodies are the body’s natural defense against this infection mechanism. An antibody is a large protein that can bind to SARS-CoV-2 receptor binding domain (RBD), blocking the RBD-ACE2 binding. However, manufactured antibodies are expensive and time consuming to produce, and have a short shelf life. On the other hand, smaller proteins are easier to produce and store. Designing such proteins using computational methods is impossible due to the exponential number of possible amino acid sequences that would need to be searched. Protein design using the online game Foldit can tackle this problem by crowdsourcing human creativity. Therefore, we seek to use Foldit to design a small protein that effectively binds to SARS-CoV-2 spike RBD. To stably bind to RBD, the proposed protein contains a bundle of helices contacting the target with double beta sheets. The stability and binding strength of the proposed structure was measured using Rosetta energy units, binding energy (delta delta G), and the surface area of the binding interface. In conclusion, the presented protein is small and predicted to stably fold as well as bind to the RBD target, providing a potential therapeutic candidate.

Mentor(s):

Zahra Tehrani (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 171
Presentation Time: Session 1: 9am-10:30am

Global Birth Stories

Author(s):

Sophie Mbongo† (Liberal Arts)

Abstract:

(Truly) Global Birth Stories

Sophie Mbongo, Amanda Veile (Purdue University, Anthropology), Melanie Martin (University of Washington, Anthropology)

Global Birth Stories is an online anthropology archive purposefully aimed at amplifying the birth stories of Black and Indigenous women of the global majority. GBS seeks to move away from the typical birth stories of Western women or even economically privileged women in other areas around the globe. Instead, GBS focuses on birth stories of women with varying access to health care, such as very rural areas where the nearest clinic is far away and might not even have obstetrical care. This anthropology project examines how different populations are birthing within the broader context of colonization, racism, capitalism, and pronounced economic and health inequities. How is birth experienced by contemporary hunter-gathers like the BaAka in the Central African Republic or forager-farmers like the Amazonian Tsimane in Bolivia? GBS also examines how young mothers in these populations may birth differently than their mothers or grandmothers. How has medicalization (e.g., hospitals, cesareans) affected birth in the recently urbanized Argentine Toba and the Yucatec Maya? GBS invites other researchers to submit women's birth stories at their field sites. An IRB is not required as long as the proper consent process is followed. The utilization of social media appeals to the current realm of social outreach and information spread. Free, online publication of these stories free will expose fellow academics, obstetricians, and the broader public to ways of birthing that are they would rarely conceptualize. In conclusion, Global Birth Stories can revolutionize ideas and narratives of birth, motherhood, and beyond.

Mentor(s):

Amanda Veile (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 172
Presentation Time: Session 1: 9am-10:30am

Tracking Lipid Alteration Patterns in the Lungs Following Silver Nanoparticle Inhalation Exposure

Author(s):

Nicolas Medel† (HHS, Honors)

Abstract:

Silver nanoparticles (AgNPs) are commonly used in manufacturing processes and consumer/biomedical products. Inhalation is the primary route of nanoparticle exposure and AgNPs have demonstrated lung toxicity including oxidative stress, inflammation, and pulmonary injury. Pulmonary inflammation is associated with diseases including fibrosis, asthma, and cancer. Bioactive lipids govern initiation and resolution of inflammation. Currently, there is little understanding regarding pulmonary lipid-mediated mechanisms of inflammation following nanoparticle inhalation. This knowledge gap impedes our ability to treat exposures and diseases where inflammation is a primary component. Within this study, we hypothesize AgNP exposure will induce a pulmonary inflammatory response via the dysregulation of lipid mediators. To test this hypothesis, 3 mice were exposed to 50µg of AgNPs and 3 mice to vehicle via oropharyngeal aspiration. Three days following exposure, bronchioalveolar lavage fluid (BALF) and the right lung lobes were collected while the left lung lobe was frozen in carboxymethyl cellulose. BALF analysis demonstrated increased total protein levels, inflammatory cytokines, and inflammatory cells due to AgNP exposure. Similarly, AgNP exposure increased gene expression of inflammatory genes including IL-1b, IL-6, and CXCL1. Desorption electrospray ionization mass spectrometry (DESI-MS) was employed to assess spatial alterations in lipid mediators and demonstrated AgNP-induced alterations. The lungs were evaluated via hyperspectral darkfield imaging to determine AgNP localization and stained with hematoxylin and eosin to histologically evaluate inflammation within the lung. Overall, our study demonstrates lipid dysregulation may mediate AgNP-induced inflammation following particulate inhalation. This information can be utilized to inform therapeutic strategies regarding inflammatory-mediated diseases resulting from exposures.

Mentor(s):

Jonathan Shannahan (HHS); Christina Ferreira (Purdue University); Saeed Alqahtani (Veterinary Medicine)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 173
Presentation Time: Session 1: 9am-10:30am

Purdue Induction Mentoring: Supporting Newly Qualified Teachers During Their First Two Years

Author(s):

Micaela Menchaca† (HHS)

Abstract:

The importance of induction mentoring has been emphasized in studies and teacher education since its conceptualization in the 1980s. Yet, many first-year teachers are challenged to continue the development of pedagogical content knowledge (PCK) initiated in academic programs, of teacher resilience, of a sense of community in their district and with local stakeholders. Our research aims to address these challenges and can be broken down into two main goals: 1) identify common needs in Purdue's induction mentoring program and 2) implement changes in Purdue's induction and mentoring program based on those needs. To determine areas of challenge and need, we will conduct focus group interviews to document pre-service teacher narratives prior to induction and through their first two years of in-service teaching. Transcription of interviews collected across the two years will be entered into a coding program to detect common mentoring needs. Based on the previous literature, we anticipate finding themes established in past studies including issues with teacher burnout, a lack of belonging, and gaps in knowledge about disciplinary action, coping resources, and PCK integration. We anticipate making changes to the induction mentoring program informed by current needs will yield positive results in improved PCK development, increased feelings of community/belonging amongst new teachers, and an increase in teacher retention rates.

Mentor(s):

Signe Kastberg (Education); Helen Bentley (Education); Stephanie Oudghiri (Education)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 174
Presentation Time: Session 1: 9am-10:30am

Effect of Lead and Arsenic on Cerebral Vasculature of Zebrafish Viewed Through Confocal Imaging

Author(s):

Breeann Mild† (HHS, Honors)

Abstract:

ead (Pb) and arsenic (As) are naturally occurring toxic materials. Additionally, Pb was historically used in paint and as a gasoline additive, whereas As was used widely as a pesticide. The toxicological concern for both is blood vessel alterations in the brain that could lead to various neurological issues. The biological model system, the zebrafish, is used to evaluate chemicals for their potential developmental neurotoxicity and relate them to humans due to their shared genetic and biological system similarities. Zebrafish embryos of the fli1 transgenic line were treated with As, Pb, or mixtures of the two metals. The treatment occurred at three different concentrations: 0 ppb (μg/L) (control), 10 ppb, or 100 ppb of the single metal or a 10 ppb or 100 ppb mixture of each metal. After exposure through the end of embryogenesis (1-72 hours post fertilization), the larvae were washed and prepared for confocal imaging with the midbrain and hindbrain being points of interest. These fli1 larvae have their blood vessels fluorescently labeled to distinguish endothelial tissue versus vasculature. The number of vasculogenic sprouts, complete branches, length of choroid vascular plexus, and the length of the basal artery were measured. It was hypothesized that the As and Pb mixture exposure will have an additive effect on vasculature development in the larval zebrafish brain seen through the number of sprouting blood vessels and the number of complete blood vessels. Results showed that there were significant decreases in branching, sprouting, and total vasculature in several concentrations in both the midbrain and hindbrain (p<0.05). Overall, this study represented the connection of As and Pb to cerebral vasculature alterations. Future studies will determine underlying gene expression changes related to these outcomes.

Mentor(s):

Jennifer Freeman (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 175
Presentation Time: Session 1: 9am-10:30am

Autonomous Vehicle Traffic Sign Detection and Simulation

Author(s):

Suyash Mishra† (Engineering); Anshul Kulkarni† (Engineering); Aayush Patel† (Engineering); Philip James† (Science)

Abstract:

Autonomous vehicles come with many subproblems that need to be addressed before becoming a staple in global societies. Among one of these subproblems is the issue of traffic sign detection. Autonomous vehicles must be able to properly understand and respond to different traffic signs, as someone's life could be severely impacted with faulty recognition mechanisms. The National Sleep Foundation has reported that about 50 percent of all Americans have driven while dealing with drowsiness. This statistic underscores the need for autonomous vehicle traffic sign detection. The amount of help it could provide and aid in reducing human-induced errors is immense. Our research is aimed at tackling this exact problem through a two-part system: a neural network based object detection system that analyzes traffic signs and makes a prediction as to what the traffic sign says and a pygame simulation that produces an appropriate traffic response based on the neural network prediction. This two-part system has cars responding to different traffic signs such as stop signs, merging signs, and yielding signs and visually depicts the ramifications those cars have on other vehicles such as bikes, trucks and buses when making correct and incorrect decisions. By having a software simulation like this, people with non-technical backgrounds can have an understanding of the advantages and disadvantages of deep learning being used for traffic sign detection in autonomous vehicles. Additionally, it enables ease of use for people around the world who want to explore this issue and have access to our research.

Mentor(s):

Shreya Ghosh (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 176
Presentation Time: Session 1: 9am-10:30am

Defining Anticancer Actions of Lippia Origanoides on African American Triple-Negative Breast Cancer

Author(s):

Emily Morales Liddiard† (Science, Honors)

Abstract:

Breast cancer remains a concern as it is the most diagnosed cancer and is a leading cause of cancer death. Triple-negative breast cancer (TNBC) accounts for 15-20% of breast cancers and is an aggressive subtype with poor outcomes and early relapse susceptibility. Within TNBC patients, those with African American ancestry experience greater mortality and worse prognosis. TNBC lacks estrogen, progesterone, and human epidermal growth factor (HER2) receptors, relies on mitochondrial metabolic reprogramming, and is unresponsive to conventional hormone therapy. Discovering therapeutics and understanding the mechanisms of TNBC aggressiveness are necessary steps for increasing positive outcomes for African American TNBC patients. Towards the identification of novel treatment targets, the extracts of the South American plant Lippia Origanoides have previously been studied for its anti-inflammatory and antiproliferative components that exhibit cancer specificity. Our previous work indicates L. origanoides can effectively suppress viability and induce apoptosis in various cancer cell lines. Our current work seeks to gain insight on potential mechanisms leading to aggressiveness in African American TNBC, through defining the impact of L. origanoides on MDA-MB-468 breast cancer cells. Anticipated results are increased apoptosis through targeting the mechanisms associated with elevated mitochondrial metabolism of TNBC. Further research of the effects and mechanisms of L. origanoides may drive development of therapeutics to better African American TNBC outcomes.

Mentor(s):

Ignacio Camarillo (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 177
Presentation Time: Session 1: 9am-10:30am

A Novel Protein Designed for SARS-CoV-2 Deactivation Using FoldIt

Author(s):

Emily Morales Liddiard† (Science)

Abstract:

The COVID-19 pandemic has led to an urgent need for treatments, especially of early infection before the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) spreads to the lower respiratory system. Infection is caused by the binding of the SARS-CoV-2 receptor-binding-motif (RBM) to the human angiotensin-converting enzyme 2 (ACE2) cell receptor. A potential treatment approach is to disrupt RBM-ACE2 interaction by designing a binder protein to the SARS-CoV-2 RBM. Computer programs used to design such binder proteins are limited in their ability to accurately predict protein structure due to the unlimited number of possible structures that would need to be searched. The program Foldit uses human creativity and intuition in conjunction with the computational power of the protein modeling algorithm Rosetta to allow citizen scientists to design low energy, stable proteins. In this project, an inhibitor protein for the SARS-CoV-2 spike protein was designed using Foldit and computationally evaluated for stability and binding strength. Four metrics were used to measure whether the design objectives were achieved: Rosetta Energy Units, binding energy (delta delta G), contact surface area, and unsatisfied polar atoms. The proposed protein structure consists of an alpha-helix bundle that is predicted to stably bind to the RBM target and could serve as a competitive inhibitor of SARS-CoV-2, aiding in the development of novel therapeutics.

Mentor(s):

Zahra Tehrani (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 178
Presentation Time: Session 1: 9am-10:30am

Understanding How NASA Flight Controllers Achieve Resilience for the International Space Station (ISS)

Author(s):

Jackson Murray† (Polytechnic Institute)

Abstract:

The future of space exploration will encounter unprecedented challenges and situations differing in scope from previous space missions. Unlike in the past, the crew's reliance on Mission Control will be limited for reinforcement and decision-making. Realistic scenarios, such as life on Mars and the voyage to Mars, lead to many untouched design opportunities for technology, experiences, displays, and more. To achieve this vision, our research institution is assisting in conquering this grand challenge by researching resilience, awareness, and robotics, to support future life on Mars. Drawing upon relevant scholarship and literature (resilience, situational awareness, adaptation, NASA, etc.), our team is crafting ideas about the role of design in supporting the astronaut and mission control experience.

Our team has conducted an interview study to explore concepts further with flight controllers, astronauts, and more. By learning about various expert perspectives and experiences, we hope to draw more data on how ISS flight controllers and astronauts respond and adapt to anomalies resiliently to provide suggestions for future Mars challenges. In our interview study, we collected multiple incident analyses from real anomaly situations, discussed how the individuals achieve resilience, and investigated adaptations made by experts. Our study totaled over 40+ hours of data and over 20 expert participants. Although still in the preliminary data analysis phase, our team wants to provide insights for NASA, and for researchers studying human factors, data visualization, and decision making.

Mentor(s):

Paul Parsons (Polytechnic Institute); Zixu Zhang (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 179
Presentation Time: Session 1: 9am-10:30am

Creating a Pitch Deck for a Potential Hollywood TV Show

Author(s):

Jackson Murray† (Polytechnic Institute)

Abstract:

Whether you are pitching a business plan to angel investors or a tech product in Silicon Valley, you want a pitch deck. Pitch decks help convey the key elements of an idea to potentially interested stakeholders, investors, or clients in a concise compelling manner. A well-designed pitch deck can capture the attention of the viewer and persuade the party to be interested in supporting the idea further.

For this project, I was tasked to create a pitch deck for a potential Hollywood TV Show called “The Monster Squad.” The TV show follows the premise of a college professor who brings together five previous students to explore the most haunted places in America. Utilizing my background in user experience design, I focused on the visual design aspect to create an appealing pitch deck. I saw the power of implementing fresh ideas, seamless color, and a unique font to tell the story of "The Monster Squad". My poster demonstrates my experience working with a Communication Professor to create a frictionless design for communicating a new TV Show idea to a client.

Mentor(s):

Doug Osman (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 180
Presentation Time: Session 1: 9am-10:30am

Evaluation of PFAS Removal Methods from Soil to Decrease Groundwater Contamination

Author(s):

Annelise Nauman† (Engineering, Honors)

Abstract:

Per- and polyfluoroalkyl substances, or PFAS, are a class of chemicals that do not naturally degrade and that have been linked to a great deal of health concerns in humans. After several decades of prevalent use in industry, it is common for PFAS to be concentrated into biosolids as a byproduct of waste treatment plants, after which that material can be used as fertilizer. However, it has been shown that PFAS are then taken up by plants and groundwater, which poses health issues for humans and animals.

It was hypothesized that water treatment residuals (WTRs) would be able to bind PFAS molecules through anion exchange and prevent them from leaching into groundwater. Preliminary experiments from our lab showed that mixing WTRs and biochar with fertilizers did indeed reduce the concentration of PFAS in water samples. This project tested the hypothesis in soil over a period of several months to determine whether mixing WTRs or biochar with biosolid fertilizers causes PFAS to bind to the WTRs and biochar, decreasing the amount that migrates into the rainwater.

Columns of soil and fertilizer were augmented with no treatment, WTR treatment, and two different biochar treatments, respectively. On a weekly basis for 25 weeks, water was passed through the columns to simulate rainwater movement through soil. Data analysis shows that for most types of PFAS monitored, the WTR and biochar columns leached less PFAS than the control column did, indicating that the treatments work to reduce the amount of PFAS traveling into the water.

Mentor(s):

Younjeong Choi (Agriculture); Elijah Openiyi (Agriculture); Linda Lee (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 181
Presentation Time: Session 1: 9am-10:30am

Social Relationships and Dual Functionality in Later Life

Author(s):

Sam Nemeth† (Liberal Arts)

Abstract:

Longer lives are often accompanied by greater risk of cognitive and physical impairments, but we investigate whether social relationships reduce the risk of those impairments. We examine dual functionality – the absence of both dementia and activities of daily living impairments -- to better understand how social factors may affect how long people maintain both their physical and cognitive functioning. Drawing from stress process and social integration theories, we examine the impact of positive and negative dimensions of relationship quality with friends and family on dual functionality in later life. We use nationally representative panel data from the Health and Retirement Study (2006-2016, N=6,985) and Weibull accelerated failure-time models to estimate parameters. Strain with family members and with friends was associated with losing dual functionality at earlier ages (-.034 [95% CI: -.056, -.012] and -.040 [95% CI: -.064, -.016], respectively). Support from family members was beneficial, related to greater time as dual functional (.038, CI: .017, .059); however, support from friends was related to losing dual functionality at earlier ages (-.025, CI: -.040, -.009). Findings reveal the implications of social support and strain in different types of relationships for dual functionality.

OBJECTIVES:

After attending this session, participants will be able to:

--describe the differences between positive and negative dimensions of relationship quality

--understand how social relationships influence dual functionality

Mentor(s):

Patti Thomas (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 182
Presentation Time: Session 1: 9am-10:30am

Analysis of International Queer Coming-of-Age Cinema Directed by Women

Author(s):

Maesa Ogas† (Agriculture, Liberal Arts, Honors)

Abstract:

In 2019, over 1.2 billion movie tickets were sold in the United States. The box office made over 11 billion dollars that year. There is an overwhelming majority of men in the film industry, with only 30% of all directors being women. Due to the sheer number of Americans going to see movies each year, it is crucial that they are shown not just a singular voice, but rather films that represent the diversity within the world and the multitude of experiences on this planet. That is why this research project was conducted, studying movies directed by women, and in particular, depicting the unique experience of queer coming-of-age stories. This selection of American and international films was directly contrasted with those directed by men. In addition to watching these films, research involved studying literature on queer cinema, coming-of-age cinema, and women's cinema. By examining how women portray these stories distinctly from men, the importance of a female perspective has been shown to be essential. The camera angles, shots, and dialogue paint a completely different image of a similar experience. Viewers are shaped by what they see on the screen, and it is therefore necessary to see accurate portrayals of said experiences. Going forward, more resources and energy need to be put into diversity within the film industry so that these voices can be better heard and shared with the world.

Mentor(s):

Megha Anwer (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 183
Presentation Time: Session 1: 9am-10:30am

Purdue Aerial Robotics Team (PART)

Author(s):

Matthieu Opdyke† (Engineering, Honors); Andrew Swanback† (Engineering); Corey Auerbach† (Engineering); Cam Johnson† (Polytechnic Institute); Evan Kamm† (Engineering); Aidan Bilger† (Engineering); Leonard Jung† (Engineering); John Rolfe† (Engineering); Eric O'Keefe‡ (Engineering); Mahesh Madhavan‡ (Engineering)

Abstract:

PART is developing a two-vehicle system to compete in the Association of Unmanned Vehicle Systems International (AUVSI) Student Unmanned Aerial Systems (SUSA) competition. PART's Uninhabited Aerial System (UAS) air-drops an Uninhabited Ground Vehicle (UGV), both of which will complete a series of tasks demonstrating their ability to operate and navigate autonomously while performing remote sensing missions representative of real-world problems. Maturing UAS's ability to function within the National Airspace System (NAS) is a top priority for NASA and the FAA. Additionally, the US Department of Defense (DoD) and its international partners are seeking autonomous solutions to reduce the warfighters direct exposer to danger. PART is fostering an ecosystem to mature undergraduate students for academic, industry, and government engineering and business management positions that help NASA, the FAA, and the DoD close the existing capability gaps in UAS maturity. Specifically, PART addresses five Aeronautics Research Mission Directorate (ARMD) Strategic Thrust objectives: (1) Safe, Efficient Growth in Global Operations, (2) Ultra-Efficient Subsonic Transports, (3) Safe, Quiet, and Affordable Vertical Life Air Vehicles, (4) In-Time System Wide Safety Assurance, and (5) Assured Autonomy for Aviation Transformation. Through the development of their next-generation UAS, PART has achieved an integrated design that carves a path to meet and exceed these objectives.

Mentor(s):

Shreyas Sundaram (Engineering); Charles D'Onofrio (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 184
Presentation Time: Session 1: 9am-10:30am

Structural and Functional Characterization of Phospholipase Cβ

Author(s):

Kennedy Outlaw† (Science)

Abstract:

Phospholipase C β (PLCβ) plays an important role in cardiovascular diseases and opioid analgesia. PLCβ catalyzes the hydrolysis of the inner membrane lipid into two crucial secondary messengers, phosphatidylinositol-4,5-bisphosphate (PIP2) to inositol-1,4,5-triphosphate (IP3) and diacylglycerol (DAG), which activate multiple signaling pathways to modulate cellular behavior. PLCβ is activated downstream of G-protein coupled receptors (GPCRs) by the heterotrimeric G protein subunits Gαq and Gβγ. In small-angle X-ray scattering (SAXS) experiments, the solution structure of PLCβ had additional density unaccounted for in crystal structures, suggesting that its structure was more dynamic than previously thought. To test this, we used cryo-electron microscopy (cryo-EM) single particle analysis to determine the solution structure of full-length PLCβ3 to 4.1 Å resolution. PLCβ3 adopted a compact, autoinhibited conformation under these conditions. This structure confirmed that the proximal C-terminal domain interacts with the core of PLCβ, but the autoinhibitory X–Y linker does not, suggesting more complex regulation of the lipase by the membrane. We are currently working to determine the structure of PLCβ3 on a model membrane to reveal the basally active state of the lipase.

Mentor(s):

Angeline Lyon (Science); Isaac Fisher (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 185
Presentation Time: Session 1: 9am-10:30am

Simulating Human Behavior in Game Engines

Author(s):

Manas Paranjape† (Science, Honors); Robert Gentle† (Engineering); Siwen Hu† (Science); Robert Rozhanskyy† (Engineering)

Abstract:

Human behavior is complex and essential in simulating architectures, but pre-existing research limitations and unpredictable human reactions require a flexible and versatile tool. Hence, the research aims to develop an adaptable AI-driven machine-learning simulation engine that architects and landscape architects can use to make intelligent decisions about future projects. This research team selects Unity3D and Unreal Engines as the most promising options and compares them across multiple dimensions: ease and accuracy of production by coders, adjustability options by designers, and data outputs to be used by everyone. The investigation begins with generating simulated people (NPCs) that have adjustable and adaptable personalities. Then the team creates a testing scene with realistic environmental variables. NPCs must determine optimal paths to a goal while dealing with the environment as their personality might dictate. The decision of preferring Unity3D or Unreal Engines is determined by the discussion of opportunities and constraints of each engine for use in a multidisciplinary team or operators and researchers presented through the previously described testing environment.

Mentor(s):

Dave Barbarash (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 186
Presentation Time: Session 1: 9am-10:30am

Musical Career Day Project

Author(s):

Kareena Patel† (Liberal Arts)

Abstract:

Music is a big part of children's lives as it encourages creativity and allows them to express themselves. It might also inspire them to explore musical careers in the future. There is an overwhelmingly large focus on music teaching and performance. However, these two career pathways comprise a small portion of the many musical career pathways in the music industry and business. This research analyzes prominent music education journals to gain a closer look at the music industry and business jobs. The analysis findings concluded that there is a lack of discussion about various careers outside of teaching and performance. Outcomes and future implications are included for the target audience of music educators in a classroom setting. Further discussion is required to depict a more accurate view of the music field to children in the classroom.

Mentor(s):

Christopher Cayari (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 187

Presentation Time: Session 1: 9am-10:30am

Analysis of metals in welding electrode, fumes, and respirator filter

Author(s):

Nicholas Pecoraro† (HHS, Honors); Shane Limas† (HHS, Honors)

Abstract:

People can be exposed to metallic aerosols in occupational settings such as welding and smelting. Metallic aerosols have been widely observed to have detrimental effects on people with enough exposure. Some of these effects include neurological damage and cancers. More specifically, chronic exposure to manganese in the welding fumes can cause manganism (also called manganese poisoning) which includes a variety of psychiatric and motor disturbances. To protect people, understanding the source and path of manganese in the welding process is important. In this study, metal contents in the welding electrode used in metal inert gas welding were analyzed using the field portable X-ray fluorescence (XRF). Metals in the welding fumes produced during welding and captured in the respirator filter were also analyzed. The concentration ratio of manganese to iron in the welding electrode was 0.014 while one in the welding fumes was 0.049, which shows that manganese can more easily form aerosols than iron. This is because the manganese melting point (1246°C) is higher than the iron (1538°C). The ratio of manganese to iron in the welding fumes captured in the respirator filter was 0.115 which is also higher than the ratio of source materials. In the future, we will study further at different welding conditions.

Mentor(s):

Jae Park (HHS); Chang Geun Lee (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 188
Presentation Time: Session 1: 9am-10:30am

Structural Insights into Phospholipase Ce using Fabs

Author(s):

Sanika Pelnekar† (Science, Honors)

Abstract:

Phospholipase Ce (PLCe) hydrolyzes phosphatidylinositol 4,5-bisphospate (PIP2) to inositol 1,4,5-trisphosphate (IP3) and diacylglycerol (DAG) in response to stimulation of G-protein coupled receptors (GPCRs) and receptor tyrosine kinases. Previous research has shown that aberrant PLCe activation and overexpression is associated with stress-induced cardiac hypertrophy. The goal of this project is to use antigen-binding fragments (Fabs) to obtain a high-resolution structural reconstruction of PLCe. Fabs form stable complexes with a protein of interest in solution, and serve as defined features that can be used for accurate image alignment in cryo-electron microscopy (EM). In the Lyon Lab, prior studies showed that the PH and RA domains of PLCe contribute to maximal activity of the protein. Because the protein is dynamic in solution, it has been challenging to determine the structure of PLCe. We predict that this problem can be solved with the use of domain-specific Fabs to stabilize these dynamic domains and/or act as fiduciary markers. The goal of this project is to map the binding sites for five different Fabs on PLCe and identify the most promising candidates for structure determination studies. The first part of this project included transforming and isolating the Fabs for complex formation with PLC variants. The structures of the Fab-PLCe complexes will aid in ongoing studies to map the binding sites of G proteins activators and the structural analysis of full-length PLCe.

Mentor(s):

Angeline Lyon (Science); Kadidia Samassekou (Science); Elisabeth Garland (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 189
Presentation Time: Session 1: 9am-10:30am

Comparison of Water- and Fructose-Based Optical Clearing Methods for the Visualization of Innervation Patterns in Murine Hindlimbs

Author(s):

Mei Phillips† (Engineering)

Abstract:

Optical clearing is a technique that allows for the in-depth study and characterization of cellular morphologies of various tissue types by making tissues transparent. This technique is garnering attention in various fields of research but remains limited in the types of tissues that can be cleared without compromising the structural integrity of the tissue. Previously, the Jing et al. group developed a polyethylene glycol (PEG)-associated solvent system (PEGASOS) that allowed both hard and soft tissues to achieve complete transparency. This water-based optical clearing method was used in conjunction with immunolabeling to examine the innervation within the long bone structure. Alternatively, a fructose-based optical clearing method has previously been used to study various musculoskeletal tissues non-destructively—without bone demineralization. Here, we present the application of these methods to injured and un-injured murine hindlimbs for the characterization of structural changes in a non-invasive joint injury-induced model of Post-Traumatic Osteoarthritis (PTOA). The purpose of this study is to determine and compare the efficacies of the two optical clearing methods in visualizing the genicular nerves in injured joints of murine hind limbs. We anticipate that the adaptation and application of these methods for the investigation of knee joint innervation will serve as a preliminary step in developing and providing researchers with tools to validate animal models of various joint diseases and injuries.

Mentor(s):

Deva Chan (Engineering); Rahaf Salim (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 190
Presentation Time: Session 1: 9am-10:30am

Formulation of Preservation Solutions for Model Generation with In Vivo Tissue Morphology

Author(s):

Holly Pickett† (HHS)

Abstract:

Historically, standard tissue fixation methods present an unrealistic representation of in vivo tissue morphology. These resultant alterations, such as tissue hardening, not only hamper development of key connections between form and function in the anatomy classroom, but also the critical diagnostic skills necessary to attain clinical gains. The aim of this project is to develop a new tissue preservation method to bridge such gaps. This involves assessing the effects of a modified-release fixation component in solution containing physiological electrolytes. Porcine lungs were dissected into lobes and placed in two solutions with different concentrations of the fixation component, and were observed using tactile manipulation for in vivo tissue resilience over the course of four months, also being attentive to bacterial growth that could lead to decay. Investigative results revealed the ability of the modified-release fixation component to prevent tissue degradation for an extended period of time, as demonstrated by the lack of microbial growth and retention of structural integrity. Furthermore, as expected, the concentration of the fixation component in solution displayed direct correlation with negative morphological effects. Further experimentation will focus on analyzing the effects of albumin, an osmotically active plasma protein, on the preservation of lung tissue samples, as well as using mechanical ventilation to measure the preservation solution's ability to retain lung tissue's elastic properties. Once developed, this preservation method can then be applied in the construction of functional anatomical models to be utilized in active learning environments to facilitate the intimate clinical connections between structure and function.

Mentor(s):

Lisa Hilliard (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 191
Presentation Time: Session 1: 9am-10:30am

Freedom, Chaos, Invisible Cages, or Self-Discipline: Financial Dependence and Schedule Control Among Gig Workers on Amazon's Mechanical Turk Platform.

Author(s):

Daniel Pinzon Quintero† (Liberal Arts); Julieta Aguilar* (HHS, Liberal Arts)

Abstract:

In theory, people doing gig work are free to set their work schedules. In practice, however, they may still not have the schedules they want. To some extent, this is because they are often still subject to constraints imposed by customers (Yin, Suri, and Gray 2018) and because worker rating systems can encourage unsocial, unstable, or long hours (Rahman 2021; Wood et al. 2019). Paradoxically, a lack of constraints can also be a problem. Constraints act as support structures, and without them, people may be more likely to procrastinate, overwork, or work at suboptimal times (Lehdonvirta 2018). One potentially crucial factor in determining if theoretical control becomes actual control is financial dependence on earnings from a platform. Platform dependence may act as a "disciplinary device" that encourages workers to take any work they can find, thus allowing customers to dictate work schedules (Lehdonvirta 2018; Schor et al. 2020). Alternatively, dependence may help workers avoid procrastination and establish regular work hours (Lehdonvirta 2018). Using data from a large sample of MTurk workers gathered in February 2020, I test these predictions by comparing workers who depend on MTurk income with those who do not. Because both groups are technically free to set their schedules, they may have similar levels of schedule control. However, the two groups may differ if workers who do not need the income have chaotic schedules, or if those who need the income have extra discipline or are caged in by platform working conditions or algorithms

Mentor(s):

Jeremy Reynolds (Liberal Arts); Reilly Kate Kincaid (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 192
Presentation Time: Session 1: 9am-10:30am

Self-Paced Reading and Givenness Effects

Author(s):

Noelle Plucinsky† (HHS, Honors)

Abstract:

The way we use language changes as we age, but we don't know much about how aging affects incremental, word-by-word sentence processing. Sentence processing is easier when words that have already been mentioned ('given') come before words that have not been mentioned ('new'). If words appear in the opposite order (new then given), sentence processing can become harder. This study's aim was to evaluate the role of aging and givenness on incremental sentence processing.

Forty younger adults (YAs) (mean age 26) and forty older adults (OAs) (mean age 66) completed a self-paced reading task, and their reading times were recorded for each word. The participants revealed each word in the sentence by clicking the space bar, and the time it took for them to do so was recorded. Participants read DO (double object) sentences (e.g. "the man threw the girl the ball") and PO (prepositional object) sentences (e.g. "the man threw the ball to the girl"). Sentences were presented in one of four ways: DO/Given-New, DO/New-Given, PO/Given-New, or PO/New-Given. Participants were first presented with a context sentence, which was necessary as it contributes to the lexical accessibility of the different components of the sentence.

For both groups, reading times were slower in new-given condition vs given-new condition for DO sentences, showing that older adults are sensitive to givenness during self-paced reading. Additionally, the slowdown was greater in OAs compared to YAs. This shows that givenness effects are more impactful for OA, possibly indicating an age-related inefficiency in lexical-syntactic integration.

Mentor(s):

Josh Weirick (HHS); Jiyeon Lee (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 193
Presentation Time: Session 1: 9am-10:30am

A Novel Ultrashort Echo Time Rosette k-space Trajectory 23Na MRI Technique as a Promising Practical Tool for Detecting Early Cartilage Degeneration

Author(s):

Evan Pogue† (HHS); Nicholas Buffo‡ (Engineering)

Abstract:

Purpose

Sodium (23Na) plays a crucial role in maintaining several functions in the human body, including nerve impulse transmission, cognitive function, and maintaining mechanical properties of cartilage. In a clinical setting, there is a desire to measure 23Na concentrations within patient-friendly timeframes for minimizing patient discomfort and accurately diagnosing certain medical conditions. In this study, we develop and demonstrate our proprietary 23Na MRI technique can overcome the various limitations of 23Na MRI including long scan times and poor image quality. Our technique, in comparison to previous gold-standard techniques, more accurately quantifies 23Na concentrations in the human brain and articular cartilage of the knee with a 50% shorter acquisition time while still maintaining image quality.

Methods

The brain and right knee of a healthy volunteer were scanned in a 3-Tesla MRI at the Purdue and Bergen University MRI Facilities. We compare our novel sodium imaging technique against a standard technique. We calculated image quality metrics and microstructure biomarkers using the novel acquisition technique.

Results

We estimated sodium concentration in cartilage and brain and demonstrated improved image quality against the standard methods. We also measured cartilage health and the microstructural biomarkers within the tissue.

Conclusion

Our method measures the sodium concentration accurately compared to standard acquisitions. Our vast improvements to 23Na MRI allow clinical translation as an effective diagnostic tool for early signs of tissue degeneration and enables better signal quality and reduced total acquisition time and the estimation of 23Na content and T2* as cartilage biomarker.

Mentor(s):

Uzay Emir (HHS); Deva Chan (Engineering); Cameron Villarreal (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 194
Presentation Time: Session 1: 9am-10:30am

Examining Online Content Moderation Regulation Around the World

Author(s):

Brooke Price† (Liberal Arts); Madeleine Yang† (Science)

Abstract:

In light of recent scandals related to hate speech, misinformation, and explicit content, governments around the world are mobilizing to regulate content on online platforms such as Facebook and YouTube. Some are hoping for targeted intervention for harms such as child sexual abuse material or terrorism, while others are broader in scope. How do major online content moderation legislations compare in their robustness to address speech and information harms? We draw from the Facebook Incidents Database, which collected news data from 2004-2021 and tracked 4,316 Facebook incidents and over 1,000 Facebook-related regulatory scrutiny and lawsuits. For this research, we first use the database to survey the proposed and passed Big Tech-related content legislations around the world. Second, we present case studies to evaluate the robustness of three major content legislations: the European Union's Digital Services Act (DSA), Germany's Network Enforcement Act (NetzDG), and California's social media transparency law (AB 587), given Facebook's speech and information harms in the content-related incidents.

Mentor(s):

Swati Srivastava (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 195
Presentation Time: Session 1: 9am-10:30am

Engineering challenges in re-implementation of Mesh R-CNN in TensorFlow

Author(s):

Abhirakshak Raja† (Engineering)

Abstract:

Ever since the introduction of the revolutionary model AlexNet, there have been significant progress in the field of deep learning and computer vision. This rapid progress should also be attributed to the improvements made to deep learning frameworks such as Pytorch and TensorFlow. The TensorFlow Model Garden research team focuses on creating open-source TensorFlow re-implementations of state-of-the-art Deep Learning models, specifically those in computer vision. Researchers and developers can then conveniently reuse models from the Model Garden. Mesh R-CNN makes great advances in 3D object shape prediction by building off Mask R-CNN, which is a two-stage object detector for 2D images, to not only detect objects in images but to also output a triangle mesh for its predicted 3D shape. In this paper, we document the engineering challenges encountered when reproducing Mesh R-CNN in TensorFlow. The original implementation of the model was in Pytorch. These challenges include initial research and analysis, differences in TensorFlow and Pytorch, and errors encountered during model training and debugging. Documenting these challenges will aid other engineers to re-implement another model or modify an existing one to suit their needs.

Mentor(s):

James Davis (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 196
Presentation Time: Session 1: 9am-10:30am

Enviromental Solutions for Braking Systems

Author(s):

Nicholas Rasmusson† (Management); Luke Lenz† (Engineering); Caden Kuang† (Management); Austin Adkins† (Engineering); Cheran Senthil Kumar† (Engineering)

Abstract:

In the modern world, braking systems are utilized in many portions of society, most commonly in cars. When these brakes are used, they release fumes and metals into the earth's atmosphere which pollutes the air that we breathe. We would like to formulate a way to modify these systems in order to help keep our environment clean. We conducted research into alternative systems that would cause fewer emissions, and we looked into the benefits and drawbacks of each system, such as performance, cost, availability, and practicality. Each braking system that we found gave many different benefits and posed drawbacks which leaves the final or "best" solution still up for debate. Nevertheless, we have found multiple alternative solutions to the problems that braking systems cause in automobiles today. We would like to present these potential solutions to others so we can work toward a world with a safer environment and a cleaner atmosphere.

Mentor(s):

Shreya Ghosh (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 197
Presentation Time: Session 1: 9am-10:30am

Purdue Summer Training, Awareness, and Readiness for Semiconductors

Author(s):

Noah Rediker† (Engineering)

Abstract:

Education to prepare students for the semiconductor industry is emerging at many universities today. To further develop this field of education, Purdue University has begun programs in semiconductors: a new First-Year Engineering seminar and a summer program focusing on semiconductor design and manufacturing. The objective of the design track of the summer program is to train motivated students on the complete design flow of application-specific integrated circuits (ASICs) and facilitate the creation (tape-out) of their first IC. Course materials from Purdue's ECE 20007, 27000, and 33700 classes will be adapted and referenced to create the materials necessary for students to learn the basics of digital electronics and combinational and sequential digital design in a three-week period. Through a review of existing programs and materials in the study of semiconductors in universities, these materials will be refined and tested during this spring semester. With the help of student assistants, teams of students will then create a design project to be taped-out with the assistance of efabless and their open-source platform. The program aims to find its students left with the equivalent learning of a hands-on industry internship. Students should be able to take the information learned during the program in their future studies, research, and internships. Additionally, hopes are that the students gain sufficient experience to be able to tape-out ICs on their own using open-source and publicly-accessible platforms such as efabless.

Mentor(s):

Mark Johnson (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 198
Presentation Time: Session 1: 9am-10:30am

Integration of Nuclear Safety and Security in Research Reactors using a Monte Carlo Simulation aided Analytical Hierarchy Process

Author(s):

Emma Rekeweg† (HHS)

Abstract:

Nuclear safety and security are essential elements wherever nuclear and radioactive materials are utilized. Although both elements are important, it can be challenging to integrate the two because of their inherent differences in planning and implementation. This study analyzed the potential for synergy between nuclear safety and security within a research reactor setting. Between the two elements, eight points of overlap were identified where integration was observed. A survey was distributed to research reactor staff, who were asked to rate these eight criteria using the analytical hierarchy process (AHP). AHP is a multi-tiered method using a pairwise comparison matrix to rate criteria within and across each tier. The eight criteria were weighed against each other according to their respective importance. This prioritized which criteria had the greatest potential to synergize safety and security. After the AHP data was aggregated, a Monte Carlo simulation with a beta-PERT distribution was applied to further analyze the data for statistical significance and decrease judgment uncertainty. Results showed that culture and education/training have the highest potential for synergy, thereby indicating that integration among these criteria would be most beneficial to the overall protection of a facility. Specific safety and security work functions in the research reactor setting are also being evaluated to best determine how to apply synergy.

Mentor(s):

Jason Harris (HHS); Theodore Thomas (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 199

Presentation Time: Session 1: 9am-10:30am

Interleukin-6 Predicts Subjective Health and Mortality in National Sample

Author(s):

Olivia Richter† (HHS, Honors)

Abstract:

As age increases, odds of developing chronic conditions and the severity of these conditions increase. Although the number of chronic conditions and their severity are strong predictors of mortality, data shows that people with similar disease burden do not have the same probability of mortality. Previous studies have found self-rated health (SRH) moderates the association between disease burden and mortality; however, explanations for this interaction have yet to be explored. We hypothesized that high levels of inflammatory markers in the body, interleukin-6, C-reactive protein, and fibrinogen, is an explanatory factor in the role of SRH as a moderator between disease burden and mortality. Data were from the Biomarker subsample from the second wave of the Midlife in the US study (MIDUS, N = 1,255). Disease burden was measured using the Multimorbidity Weighted Index, which weighs conditions by their probability of causing disability and sums the values. Inflammatory proteins were measured in the plasma. Data on mortality were collected through 2018. Logistic regression models showed these inflammatory markers did not significantly explain the interaction of SRH and disease burden in predicting mortality. However, IL-6 significantly predicted mortality independent of SRH and accounting for age and disease burden as possible confounding variables (p<.001). Moreover, levels of IL-6 were significantly inversely associated with SRH scores (p<.001). This study suggests that while the cumulation of three inflammatory markers does not explain the moderation of disease severity by SRH, high levels of IL-6 are associated with poorer perceived health and shorter lifespan.

Mentor(s):

Elliott Friedman (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 200
Presentation Time: Session 1: 9am-10:30am

Identifying Racial Disparities in Crime & Healthcare

Author(s):

Alexia Rodrigues† (Science); Alex Liu† (Science)

Abstract:

Together, we are investigating potential racial and geographic disparities within crime and overdose rates. This is done by modeling regressions and creating heat maps to visualize potential factors, such as median income and education, which are impacting the racial disparities with overdose rate. As for crime rates, we have separated the data into different groups by race, crime, and location, and are looking at crime ratio graphs. With this, we are analyzing the data trying to find significant correlation between race and crime rates throughout the years. Altogether, the goal is to create a prediction model to demonstrate the future crime and overdose rates for specific racial groups to guide policy making.

Mentor(s):

Pengyi Shi (Management)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 201
Presentation Time: Session 1: 9am-10:30am

Analysis of the tail protein functions in the PurduePete bacteriophage genome and its applications

Author(s):

Braden Rutledge† (Agriculture, Engineering); Jenna McLean† (Agriculture, Engineering); Connor Meek† (Agriculture, Engineering); Ryan Buencamino† (Agriculture, Engineering); Mario Perez-Ahuatl† (Agriculture, Honors); Susan Lintott† (Agriculture, Engineering); Francesca Hamacher† (Agriculture, Engineering); Grace May† (Engineering); Gabriela Surdyka† (Agriculture, Engineering); Ella Jameson† (Agriculture, Engineering); Kay Annunziata† (Agriculture)

Abstract:

Bacteriophages are viruses that infect and replicate within a bacterial host using the bacteria cells' resources for its own reproduction and survival. The focus of this research is to examine the genes that affect the tail within PurduePete, a bacteriophage discovered at Purdue University. The tail of the bacteriophage facilitates the attachment and injection of the genomic material from the bacteriophage into the bacterial host. There are many different genes that influence the structure and function of the bacteriophage's tail such as tail sheath proteins, tape measure proteins, tail assembly chaperones, baseplate J proteins, and several minor tail proteins. The genes of interest in this study are located in the base pair region, 68714-82697. The functions of these genes were identified using gene sequencing technologies including: DNAMaster, Phamerator, GeneMark, and other bacteriophage genome databases such as NCBI. Through the annotation of base pair region 68714-82597, many characteristics of PurduePete's tail were better understood which could be applied to other bacteriophages in future research such as immunotherapy, disease recognition, and novel treatments for bacterial infections.

Mentor(s):

Kari Clase (Agriculture); Aaron Gin (Engineering); Jason Lee (Engineering); Quintin Walter (Engineering); Brady Stinson-Smith (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 202
Presentation Time: Session 1: 9am-10:30am

Comparison of a bispecific adaptor binding affinity between murine FAP and human FAP

Author(s):

Tushar Sardesai† (HHS, Pharmacy, Honors)

Abstract:

Cancer associated fibroblasts (CAFs) make up an immunosuppressive tumor microenvironment, and exclusively express fibroblast activation protein (FAP). We aimed to target FAP for our cancer immunotherapy via a bispecific FAP-FITC adaptor that binds to FAP protein. Chimeric antigen receptor (CAR) T cells have been previously designed to selectively recognize fluorescein (FITC). With the addition of FAP-FITC, a bridge is formed between the anti-FITC CAR-T cells and the FAP expressing CAFs, which then mediates killing on CAFs. The purpose of this study was to determine if there are any binding differences of our bispecific FAP-FITC adaptor between human fibroblast activation protein (hFAP) and murine fibroblast activation protein (mFAP). We currently know the binding affinity of our FAP-FITC bispecific adaptor on hFAP expressing cells, but since our in vivo trials are in mice with mFAP expressing CAFs, the binding affinity of FAP-FITC to mFAP expressing cells needs to be investigated. This study began with plasmid purification of a vector carrying the m-FAP gene. This vector was then used to create a lentivirus containing m-FAP gene, and the lentivirus was used to transduce an MDA-MB231 tumor cell line for over-expression of mFAP. Binding and killing assays were then conducted on the MDA-MB231-mFAP cells. Our results showed similar binding and killing results between h-FAP and m-FAP cell lines using the same FAP-FITC adaptor. This similarity will allow us to predict our mice trials results, and potentially predict results in future human trials as well.

Mentor(s):

Philip Low (Pharmacy); Bo Huang (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 203
Presentation Time: Session 1: 9am-10:30am

Investigating Explainability of ML Model Decisions for Injury Surveillance

Author(s):

Anusha Sarraf† (Science)

Abstract:

Injury surveillance is essential for understanding the circumstances and factors leading to various types of injuries at the workplace. The workplace injury reporting mechanism by Occupational Safety and Health Administration (OSHA) requires recording how the injury happened in a textual description format. The unstructured text is then processed into a structured format by assigning injury diagnostic codes such as the external cause of injury or event code. Previous studies have used machine learning (ML) models trained on historical injury data to predict the event code based on the injury narrative with reasonable accuracy. However, the prediction performance of the ML models has been found to be limited for categories that are very similar in their definitions. The purpose of this project is to investigate deeper into the causes behind the misclassification of closely related categories using multiple ML models. Our initial study using a multi-class logistic regression classifier trained on this dataset corroborated this behavior: the model was highly accurate in assigning categories for the overall data but there were frequent misclassifications for closely related categories such as “struck by object” and “struck against object”. We intend to apply techniques from recent advances in the field of explainable artificial intelligence (XAI) to understand words or groups of words predictive of each event for binary classification of these categories as well as in a multi-class classification setting with all the event codes being predicted by the ML model.

Mentor(s):

Gaurav Nanda (Polytechnic Institute); Romila Pradhan (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 204
Presentation Time: Session 1: 9am-10:30am

Physical literacy and its association with physical activity

Author(s):

Riley Schellingerhout† (HHS, Honors)

Abstract:

Research has shown the importance of physical literacy (PL) in developing motor skills and the confidence to utilize these skills to engage in physical activity (PA). However, it remains unknown how PL is associated with individuals' psychological characteristics and actual PA at different intensities. Understanding these associations is important because it may inform strategies that increase PA through promoting PL. Therefore, the purpose of this study was to identify PL's relationships with self-reported PA as well as its psychological determinants, including personality traits, dispositional mindfulness, and tendency to engage in and tolerate high-intensity PA. A total of 226 young adults (19-24yr, 137 females) completed the Five-Facet Mindfulness Questionnaire (FFMQ), Big Five personality inventory, Preference for and Tolerance of the Intensity of Exercise Questionnaire, and International Physical Activity Questionnaire. The associations of these measures with PL were analyzed using hierarchical regressions. After controlling for age, sex, and body mass index, the analysis showed significant associations of higher levels of PL with high extraversion, high conscientiousness, and low neuroticism traits. Higher PL was associated with higher scores on all FFMQ facets, excluding the observing facet, as well as greater preference for and tolerance of high-intensity PA. Higher PL was related to more self-reported PA across intensities. These findings extended previously reported beneficial associations of PL with actual and perceived motor competence by providing preliminary evidence that PL may be a potential intervention target for increasing PA and influencing its related psychological determinants.

Mentor(s):

Alvin Kao (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 205
Presentation Time: Session 1: 9am-10:30am

Early Food Insecurity: The Impact of Childhood and Adolescent Food Insecurity upon adulthood anxiety patterns, memory, and learning.

Author(s):

Kathryn Schwartzman† (Agriculture, Honors); Victoria Patellos* (HHS); Elaine Esposito* (HHS); Cameron Robinson* (HHS)

Abstract:

Food insecurity, as defined by the USDA, is a condition that describes people or households struggling to access a consistent and adequate amount of nutritious food to maintain a “healthy and active” lifestyle. No area is immune to this issue, from cities, to rural areas, to college campuses, food insecurity is everywhere. In the United States, a large percentage of families with children struggle with lack of access, something that deeply concerns pediatricians. It is well known that children living in a food insecure environment struggle both physically and psychologically, particularly as they develop. However, there lacks an understanding of the long term psychological impact of childhood and adolescent food insecurity. This study seeks to understand the connection between childhood and adolescent food insecurity, and adulthood anxiety, memory, and learning utilizing an animal model. Utilizing rats, eight groups were established: male and female control, male and female childhood insecurity, male and female adolescent insecurity, and male and female childhood and adolescent insecurity. Food insecurity was modeled through an unpredictable amount of feed calculated each day as a certain percent of the consumption of the control animals for each sex group. “Insecurity” was created by randomizing these percents, to ensure lack of predictability within the feed schedule. Anxiety-like behaviors were tested utilizing an elevated plus maze model, while memory and learning patterns were analyzed using the novel object recognition test. Early results indicate a significant correlation between childhood food insecurity and anxiety-like behaviors in male rats.

Mentor(s):

Kim Kinzig (HHS); Brent Bachman (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 206
Presentation Time: Session 1: 9am-10:30am

The influence of sentence production training on speech fluency in aphasia

Author(s):

Nadia Seye† (Science)

Abstract:

Aphasia is an acquired language disorder that occurs from damage or injury to the brain, which is typically caused by a stroke. In this study, we are concerned with the fluency of speech production by people with aphasia (PWA). Fluency can be described as the ability to speak or write in a smooth and accurate manner. Aphasia affects the production of speech as it commonly increases speech disfluencies, suggesting more difficulty with speech production. The aim of this study is to evaluate the influence of sentence production training on the frequency of disfluencies during speech production. Data was collected and analyzed from three healthy older adults (controls) and three PWA. Participants completed baseline testing, three training sessions, and post-training testing. In baseline and post-training testing, participants completed a picture description task using either transitive (e.g."The boxer is weighed by the man") or dative (e.g. "The policeman is giving the chef the trophy") target sentences. Their responses were then transcribed and scored for correctness and fluency. Our findings show that the healthy older adults (controls) showed an average improvement in fluency of 12.2% from the baseline to the immediate post-training session. Contrarily, people with aphasia showed inconsistent results in the overall fluency measure. In conclusion, our results indicate that the sentence production training does alter speech fluency patterns, with varying outcomes for those with aphasia compared to adult controls.

Mentor(s):

Jiyeon Lee (HHS); Joshua Weirick (HHS); Willem van Boxtel (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 207
Presentation Time: Session 1: 9am-10:30am

AFTx07 Digital Integration and Optimization

Author(s):

Yiyang Shui† (Engineering); Boheng Zhao† (Engineering); Edmund Leung† (Engineering)

Abstract:

AFTx07 is a RISC-V based microcontroller under design by the SoCET team, to be taped out in October 2023. In particular, the AFTx07 project concerns implementation of digital modules using hardware description language and computer architecture design principles, all of which are critical to the successful fabrication of the design. To properly design and test AFTx07 prior to tape-out, the team has been using SystemVerilog to create custom digital modules that are simulated using tools like Verilator and Xcelium. After passing simulation tests, the design is synthesized to gate-level netlist using electronic design automation (EDA) tools such as Cadence Genus. The overall performance is evaluated through Embench, an embedded system benchmarking suite, for iterative optimization. For AFTx07, beyond integration of peripheral modules, the team has established optimization and RTL goals to improve the functionality and performance of the SoC. Major goals include implementing a branch predictor with a branch-target-buffer that would reduce the lost performance caused by incorrect branch predictions, L1 caches to increase performance with respect to instruction and data fetches, and a buffered memory controller to interface the CPU with memory. Other goals such as adding support for floating-point instructions to the RISC-V core, and extending the DMA and bus architecture to allow for concurrent memory access would be more minor goals for AFTx07 and may be pushed to AFTx08. The final product, AFTx07, will be able to provide the Purdue engineering community with the unique experience of testing and using a custom SoC. After tape-out, we plan to provide AFTx07 chips for use by other Purdue organizations that make use of microcontrollers, such as Purdue Electric Racing and Purdue IEEE teams.

Mentor(s):

Cole Nelson (Engineering); Mark Johnson (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 208
Presentation Time: Session 1: 9am-10:30am

Development of an experimental apparatus for permeability testing of porcine and human brain tissue under compressed and uncompressed conditions

Author(s):

Victoria Sinfield† (Engineering, Liberal Arts, Honors)

Abstract:

The brain plays the ultimate role of controlling every bodily function. Unfortunately, traumatic brain injuries (TBIs) can occur due to exposure to explosions or blasts, impacts, shaking, and penetration. While a deep understanding of the mechanical properties of the brain's tissues is critical to predicting the effects of TBIs on this vital organ, knowledge in this area remains not completely defined. The brain is composed of white and gray matter, and the structural differences between these tissues can result in dissimilarities in their interactions with fluid. The movement of cerebrospinal fluid in the brain is a determining aspect of how impact to the head results in brain injury. Thus, a full characterization of the mechanical properties of the brain tissue requires consideration of its permeability. This project introduces a novel testing apparatus that is able to measure the permeability of brain samples under different controlled levels of compression, within a confined environment. Preliminary testing with a polyester sponge sample of dimensions and hydraulic conductivity similar to those of a typical brain sample indicates that the apparatus provides repeatable measurements of permeability. This suggests that further testing involving porcine and human brain tissue would work as intended, and that the use of this apparatus can potentially provide a means for accurately and efficiently testing the permeability of a large amount of samples under compressed and uncompressed conditions, thus providing insights on the biomechanical properties of tissue in the brain, and their relation to the effects of traumatic brain injuries.

Mentor(s):

Eric Nauman (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 209
Presentation Time: Session 1: 9am-10:30am

Designing a Binder Protein against SARS-CoV-2 Spike RBD using the Online Game Foldit

Author(s):

Yubo Song† (Engineering)

Abstract:

The COVID-19 pandemic has caused a global health crisis with millions of infections and deaths. The viral entry mechanism of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is through the binding of its spike protein to the ACE2 receptor of human cells, allowing the virus to enter. This binding is achieved by a specific receptor-binding domain (RBD) on the spike protein. In this research, we aim to use the online game Foldit to design a binder protein that can bind to the RBD of the SARS-CoV-2 virus, thus preventing it from infecting human cells. We chose Foldit because it combines human problem-solving with sophisticated computer algorithms, allowing for creative protein design while optimizing its efficiency. The designed protein is a triple helix bundle with a higher predicted binding affinity than the ACE2 receptor for the SARS-CoV-2 RBD target, potentially outcompeting ACE2. The stability of the designed protein is evaluated using Rosetta algorithm in Foldit, which measures the energy state of the protein. This research has the potential to provide an effective treatment option for SARS-CoV-2 because the mini-binder protein can be quickly produced and administered in the early stages of infection. The results of this study will not only provide the design of an effective binder protein against SARS-CoV-2 but also contribute to our understanding of how to use Foldit to quickly design a protein that fulfills a specific research need.

Mentor(s):

Zahra Tehrani (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 210
Presentation Time: Session 1: 9am-10:30am

Usability Testing on Power Analysis Prototypes

Author(s):

Samarah Sorin† (HHS, Honors)

Abstract:

The goal of this usability testing project is to help create software that enables researchers to conduct a statistical power analysis easily and accurately. For the procedure of power analysis, the testing provides user-friendly prototypes that present the statistical output to the researchers in a specified manner. Based on the data we obtain from these prototypes, we can determine what interface features are working well, which features needs to be modified and improved, and the thoughts that users may have regarding the usability of the software. The data being analyzed include behavioral measures, answers to survey questions, and verbal interviews. The behavioral data consist of videos of the participants investigating each prototype following given scenarios to achieve a certain task goal and coding significant behaviors that are observed. The survey data provide insight into the users' thoughts and feelings about the software. The verbal interviews are transcribed and coded with a codebook to provide systematic analysis of the qualitative data about the users' experiences using the software. The results of the study will be taken into consideration in recommending improvements to the software interface and ultimately make the software as user-friendly as possible.

Mentor(s):

Robert Proctor (HHS); Jeongyun Choi (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 211
Presentation Time: Session 1: 9am-10:30am

Sexual dimorphic modulation of the gut microbiome on brain biomarkers associated with Parkinson's disease

Author(s):

Stephanie Sotelo† (HHS, Honors)

Abstract:

Parkinson’s disease (PD) is a neurological disorder disproportionately affecting more men than women. PD is pathologically characterized by the aggregation of a presynaptic neuronal protein, α-synuclein (α-Syn), and degeneration of dopaminergic neurons in areas of the brain responsible for motor function. The aggregation of α-Syn has been shown to begin in the enteric nervous system prior to affecting the brain, leading to a “gut-first” hypothesis that PD pathology may be initiated from the gut. Interestingly, the gut microbiota from human donors with PD have been found to contribute to greater α-Syn aggregation in mice. Gut microbiota can modulate sex hormone homeostasis, however, their involvement in sexual dimorphic disease pathogenesis of PD remains unclear. Herein, we aim to examine sex-specific microbiota-driven impact on brain biomarkers associated with PD. Eleven-week-old male and female germ-free mice lacking any microbiota and conventionally-raised mice harbored with natural microbiota were used to compare the presence of α-Syn and tyrosine hydroxylase (TH), an enzyme that catalyzes the conversion of tyrosine to dopamine, in the striatum and substantia nigra. α-Syn and TH will be detected using immunohistochemistry staining, imaged using confocal microscopy, and quantified using Image J. We expect conventional mice to express lower TH and higher α-Syn levels than germ-free mice. We also expect these microbial-driven differences to occur in males, but not females. The results of this study may suggest sex-specific role of gut microbiota on PD and contribute to the development of clinically useful microbiota-related therapeutics for precision medicine.

Mentor(s):

Tzu-Wen Cross (HHS); Andi Cheng (HHS); Chandnee Chandrasekaran (Pharmacy); Jean-Christophe Rochet (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 212
Presentation Time: Session 1: 9am-10:30am

Right-wing Media Engagement: Populism or Partisanship

Author(s):

Priyanka Subrahmanyam† (HHS, Liberal Arts, Honors)

Abstract:

Consumption of right-wing media sources has increased, particularly hyperpartisan outlets that reject norms of objectivity and position themselves as alternatives to the establishment media. The media is a key connector between political actors and the public, and scholars have expressed concerns that these sources use populist rhetoric and other forms of highly emotive, combative communication to drive engagement with their political content. Through their own perpetuation of populism as well as providing a platform for populist actors to increase their legitimacy and visibility, the media can no longer be regarded as a tangential aspect of populist messaging. Turning to Breitbart News as a prevailing source of right-wing news, we will examine whether different factors of populist/anti-establishment and partisan messaging drive engagement on their individual news stories. We expect media engagement will be driven primarily by exposure to populist messaging. Additionally, we expect the use of emotive, and uncivil/combative language to intensify the effects of populist rhetoric on engagement. To test these hypotheses, we will scrape Breitbart for all articles about climate change. We will analyze the title and highlight text for indicators of firsthand populism from the media, populist ideas by external political actors, partisanship, and emotion. We will then compare that to the quantity of comments on each article. Results from this study will clarify article-level factors that drive attention on right-wing media sources. In doing so, this study will illuminate some of the potential motivations of alternative media sources in pushing contentious narratives around highly salient issues like climate change.

Mentor(s):

Erin Hennes (University of Missouri); Janel Jett (University of Missouri)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 213
Presentation Time: Session 1: 9am-10:30am

VIP - Beyond 5G

Author(s):

Daanish Suhail† (Science); Aaryan Srivastava† (Science); Daniel Chen† (Engineering); Seeun Kim† (Engineering)

Abstract:

The Beyond5G team is a multidisciplinary project in wireless communications. It focuses on implementing and learning new techniques being implemented within the new 5G and 6G standards. Our team's goal is to split into a series of subteams such that we can effectively navigate various subfields between computer science, electrical engineering, computer engineering, and mathematics.

One of the significant projects being worked on this semester is with studying error-correcting codes. These schemes are applied to transform a bit-string in a way such that we can remove errors from a wireless transmission. Previously, we have investigated the application and theory of applying Hamming codes to wireless problems; now, we are interested in utilizing the Reed-Muller codes in order to effectively encode and decode messages with fewer errors. Several techniques for encoding, decoding, and constructing these codes are discussed. Simpler methods of encoding and decoding, like the Hamming code, are known to only be able to correct a single bit within a bit-string of any length. The Reed-Muller code can have a greater amount of error correction based on the parameters given. As such, investigations are presented.

Secondly, our team also is interested in the general study of new wireless technologies. We apply the theories of orthogonal communications to various wireless problems as well as investigate how concepts of convolution and waveforms can be modified to enable higher transmission speeds. We learn how transmitters send signals by implementing frequency to merge several channels and make it interpretable for receivers.

Mentor(s):

Chih-Chun Wang (Engineering); David Love (Engineering); James Krogmeier (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: STEW 214
Presentation Time: Session 1: 9am-10:30am

Characterizing the effects of space weathering on the surface of lunar grains using scanning electron microscopy

Author(s):

Kaitlyn Sycko† (Science, Honors)

Abstract:

Space weathering is a process that occurs on all planetary bodies without atmospheres that are exposed to outer space. It is driven by multiple processes such as micrometeorite impacts and solar wind irradiation. This investigation looks at how solar wind irradiation and micrometeorite impacts affect the surfaces of individual grains on the Moon's surface using scanning electron microscopy (SEM). SEM imaging techniques allow us to characterize the individual grains based on their chemical composition and grain surface morphology. We have identified a range of space weathering products and surface products. The first is agglutinates, which are aggregates of broken up mineral fragments welded together by glass. These agglutinates are a dominant space weathering product on the lunar surface formed by micrometeorite impacts and display a wide range of surface morphologies and chemistries based on their precursor materials. Some unique mineral morphologies have been identified in the agglutinates which may provide constraints on their formation conditions (e.g. temperature and timescale). We have also identified melted deposits on grain surfaces formed by micrometeorite impacts. These melt layers have varying chemistries and may contain Fe spherules and surface vesicles formed by the rapid escape of volatile gases during cooling. Lastly, we have also identified surface blistering on some mineral grain surfaces which are formed by solar wind irradiation. Grains displaying evidence of solar wind irradiation and other unique space weathering characteristics will be selected for further analyses in the transmission electron microscope to observe how the subsurface is affected by space weathering.

Mentor(s):

Michelle Thompson (Science); Alexander Kling (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 215
Presentation Time: Session 1: 9am-10:30am

Virtual Reality Technology as a Platform In Learning/Education Practice

Author(s):

Ata Tamer† (Engineering)

Abstract:

Technological advancements in today's age shape our day-to-day world by providing fantastic, unthinkable opportunities to everyone. Among the vast technological advancements throughout the twenty-first century, one area has seen tremendous improvement throughout the decade: virtual reality. Virtual reality, as implied by the name, takes users into an imaginary, but also overwhelming realistic world, where users are only limited by their imagination. In order to better understand the effects of virtual reality in learning/education practice, findings from past experiments and research articles were examined and evaluated. These articles consisted of experiments conducted by various professors around the globe who compared retention and learning ability in conventional teaching versus virtual reality education. After analyzing the results, it was noticed that virtual reality use in education provides a deeper, more concrete, and more exciting learning experience to students than conventional teaching. Virtual reality's powerful immersiveness through digital aid makes the imaginary world nearly one-to-one with reality. Therefore, any task that a student executes in the imaginary world provides an equivalent and/or superior learning outcome that helps them succeed in real life. Due to this, students tend to remember material better for the future and come out establishing better core knowledge/understandings. Virtual reality is the key to providing an efficient, engaging, and high quality learning experience that allows students to succeed in real life; and coupled with today's worldwide accessibility, it can substantially help improve learning everywhere.

Mentor(s):

Mesut Akdere (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 216
Presentation Time: Session 1: 9am-10:30am

Development of Bi-based High Temperature Solders

Author(s):

Patrick Thompson† (Engineering)

Abstract:

Soldering is a critical process in many manufacturing and repair applications. It involves melting an alloy to join two metal surfaces together. They are used in electronics manufacturing, plumbing, and automotives. Historically, lead solders have been used the most because it is soft and malleable, with a low melting point and good wetting characteristics. However, lead is a toxic substance that can be harmful to human health and our environment. The European Union's criteria for lead in electronics is less than 1000 ppm (parts per million) and countries are continuing to ban and restrict the use of lead-based solders.

The objective of this study is the understand the properties of various alloys and develop state-of-the-art lead-free high temperature solders to use in manufacturing. Many of the common lead substitutes such as tin, silver or copper do not do well at withstanding high temperatures, so we will focus on using elements such as bismuth, tin, and antimony, with the goal of having a melting point under 200 C and operating temperatures greater than 80 C.

To investigate its properties, we will develop Bi-Sb-Cu solder composition and study the reflow characteristics and microstructure on a Ni/Au surface finish printed circuit board. Later we will study the effect of adding rare earth impurities on the microstructure of Bi-Sb-Cu solder. We will also observe how they age over time by placing them in ovens for an extended period to simulate usage when applied in industry.

The findings of our study should be able to produce an alternative to lead in solders so we can focus on more lead-free solders to reduce the risk of harm to workers and the environment.

Mentor(s):

Shubhra Bansal (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 217
Presentation Time: Session 1: 9am-10:30am

Manufacturing Best Practice for Space Qualified and Water-Sealing Satellite Parts at On-Campus Manufacturing Centers

Author(s):

Ata Toraman† (Engineering); Philip Voronin† (Engineering); Abhirama Rachabatturni† (Engineering); Efe Albay‡ (Engineering); Adithya Kolisetty‡ (Engineering); Benjamin Roeder‡ (Engineering)

Abstract:

The Film-Evaporation MEMS Tunable Array (FEMTA) is a micro-electromechanical system (MEMS) thruster that uses ultrapure deionized water (UPW) to offer a unique, power efficient, low-cost and scalable solution to attitude control in smaller satellites. Two experiments are in development to comprehensively evaluate FEMTA's performance in space.

The aim of the Propellant Management Experiment (PME) is to investigate the efficacy of a novel, passive propellant management system. The aim of this experiment is to assess the functionality of a hydrofluoroether (HFE) based pressurant system which uses the vapor pressure of HFE to steadily feed UPW to the FEMTA thruster.The aim of the Thrust Measurement Experiment (TME) is to demonstrate the joint operation of the vapor pressure zero-g propellant tank and the FEMTA microthruster by measuring the thrust output. Both of these experiments will be conducted as part of the Blue Origin New Shepard rocket payload, during a suborbital flight scheduled for 2024.

The manufacturing team aims to consistently provide both experiments with vacuum proof and vibration resistant parts and assemblies. Due to the size and weight constraints of small satellites, the parts in the experiment need to be light, small, accurate, and cost effective. These parts are being machined at student run centers, such as the Purdue Aerospace Sciences Lab and Bechtel Innovation Design Center, where a plethora of lessons emerged as the team from the previous semester encountered and tackled challenges. This year’s team builds on and tests the lessons learned to achieve a functional product.

Mentor(s):

Jesus Meza-Galvan (Engineering); Steven Pugia (Engineering); Anthony Cofer (Engineering); Alina Alexeenko (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 218
Presentation Time: Session 1: 9am-10:30am

Computer-Aided Design of Small Molecules to Target Class B GPCRs for Chronic Pain Treatments

Author(s):

Thuc Tran Phu† (Pharmacy)

Abstract:

GPCRs, the most extensive family of membrane receptor proteins in the human body, play a crucial role in transmitting signals through various pathways such as hormones, neurotransmitters, odorants, tastants, and light. They are essential for maintaining homeostasis and are thus valuable therapeutic targets.

The primary objective of our research is to create new antagonists for PAC1R, a class B GPCR responsible for pain and stress, using computational drug design and ligand-receptor interaction simulations. With the aid of computational modeling and machine learning, we aim to refine the receptor structure and perform induced-fit ligand docking simulations, allowing us to evaluate how the ligand and receptor will interact and generate responses. From this information, we can suggest new ligands that can target this receptor for use as a drug.

We have already deciphered the PAC1 receptor structure by comparing it to the glucagon receptor sequence. Our focus is now on the binding site of both receptors, where we are mimicking 5MV, a glucagon receptor agonist, to develop a new molecule with high affinity to PAC1R. By using machine learning, we hope to conduct molecular dynamics of the docked structure, evaluating its binding affinity.

This research can provide a new approach to treat disorders because opioid treatments for chronic pain can lead to adverse effects such as tolerance, addiction, constipation, and respiratory depression.

Mentor(s):

Jianing Li (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 219
Presentation Time: Session 1: 9am-10:30am

Glycogen Utilization of Metastatic Breast Cancer Cells in Extracellular Matrix Detachment

Author(s):

Caitlin Truffer† (HHS, Honors)

Abstract:

Breast cancer is the primary cause of cancer deaths in women, and breast cancer metastasis remains the main cause of death from the disease. Metastasis is a highly energy-demanding phenomena; thus, understanding how cancer cells utilize energy substrates during metastasis may provide potential therapeutic strategies. We utilized non-metastatic MCF10A-ras and metastatic MCF10CA1a human breast cancer cells to determine the potential role of the energy substrate glucose from glycogen stores during the process of metastasis. Previous results from our laboratory showed that metastatic MCF10CA1a have significantly higher glycogen stores compared to non-metastatic MCF10A-ras (151 ug/mg cellular protein vs. 7 ug/mg, respectively). Glucose from glycogen stores can be released either through glycogenolysis via the enzyme glycogen phosphorylase (PYGL) or glycophagy via the enzyme alpha-glucosidase (GAA). We determined that inhibition of the expression of these enzymes (knockdown) using siRNA techniques reduced migration significantly by 10% and 3% in MCF10CA1a after PYGL and GAA knockdown, respectively, while no effect was observed with MCF10A-ras cells. Interestingly, in the current study, the viability of metastatic MCF10CA1a cells in extracellular matrix (ECM) detached conditions, another important step in metastasis, was significantly reduced by 24% after GAA knockdown but not with PYGL knockdown. Together, these data suggest that glycogen may support metastasis where glucose supplied through both glycogenolysis and glycophagy are necessary to support migration while glycophagy primarily provides glucose to support viability in ECM detached conditions. Thus, inhibiting glycogen utilization in breast cancer may serve as a potential therapeutic target for multiple steps in metastasis.

Mentor(s):

Dorothy Teegarden (HHS); Marjorie Layosa (HHS); Emily Hicks (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 220
Presentation Time: Session 1: 9am-10:30am

Effect of Postmortem Aging on Water-Holding Capacity of Beef Longissimus Lumborum Muscle

Author(s):

Varisra Upatising† (Agriculture)

Abstract:

Water-holding capacity (WHC) is the ability of meat to retain moisture and is one of the most important quality characteristics of meat products. Postmortem aging is a widely adopted post-harvest practice in the meat industry to improve tenderness. While the mechanism by which aging improves tenderness has been well-established, the relationship between WHC and postmortem aging is not fully understood. Therefore, the purpose of this study was to investigate the effect of aging on the WHC of beef loins by evaluating several factors relating to water-binding ability of muscle. Strip loins (M. longissimus lumborum; n=60) were collected from 30 market-weight certified Angus beef cattle at two days postmortem. The loins were divided into four groups (n=15) and randomly assigned a postmortem aging time of 2, 7, 14, or 21d at 1 °C ± 0.5°C. The compression drip loss and centrifuge water loss results revealed significant decreases as postmortem aging increased from 2d with no significant differences between 7d, 14d, and 21d (p<0.05). The pH gradually increased with increasing postmortem aging time (p<0.05). Postmortem aging had a significant impact on protein solubility, where the total and myofibrillar protein increased as postmortem aging increased (p<0.05). However, sarcoplasmic protein decreased after 2d of postmortem aging (p<0.05). The statistical analysis was performed by mixed model using SAS software (SAS 9.4, Cary, NC, USA). Least squares means for all traits were separated (F-test, p< 0.05) by using least significant differences. Further trials will have to observe changes in myofibrillar proteins related to water-holding with postmortem aging.

Mentor(s):

Yuan H. Brad Kim (Agriculture); Jinkyu Seo (Agriculture); Madison Romanyk (Agriculture); Saud Ur Rehman (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 221

Presentation Time: Session 1: 9am-10:30am

Air Collision Detection Avoidance System for Unmanned Aerial Vehicles

Author(s):

Riya Varshney† (Engineering); Hasan Sultan† (Engineering); Shriya Gupta† (Engineering); Charlie Tamer† (Engineering); Varun Vaidyanathan† (Engineering); Digvijay Pawar† (Science); Minrui Lu† (Science); Dhruv Shah† (Engineering); Dheeraj Namargomala† (Science); Vanamali Vemparala† (Science)

Abstract:

Air Collision Avoidance Systems are essential to ensure the safety of unmanned aerial vehicles (UAVs) and the surrounding airspace. With the increasing use of drones for commercial and personal purposes, it is critical to prevent collisions with other aircraft and objects in the airspace. The drone's collision avoidance system should provide early detection and warning of potential hazards, allowing the drone to avoid them swiftly.

This paper outlines the key components of an effective air collision avoidance system for drones, including sensors, algorithms, and communication systems. The system can detect objects in the drone's vicinity, including other aircrafts, birds, and other miscellaneous objects. Additionally, this system can communicate with various other systems onboard the aircraft to exchange data, allowing it to integrate seamlessly with the existing systems.

We propose three potential solutions to solve this problem. The first solution uses Light Detection and Ranging (LiDAR) technology and a dynamic cluster algorithm to detect and avoid obstacles in the drone's vicinity. The second solution uses computer vision and radio frequency detection to develop an air collision avoidance system for a UAV. The third approach proposes the use of millimeter wave radar to detect a noncooperative object's location and angle.

Overall, these approaches aim to improve the safety and efficiency of UAVs in shared airspace, making them more useful in various scientific and commercial applications. Future research will focus on validating the effectiveness of these approaches and optimizing them for real-world applications.

Mentor(s):

Charles D'Onofrio (Engineering); Yu-Chieh Chiao (Engineering); Charles D'Onofrio (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 222
Presentation Time: Session 1: 9am-10:30am

Steroidal Regulation of Peripheral Immune Compliment in Rabbits

Author(s):

Alexa Vesey† (Agriculture)

Abstract:

From previous research, it is known that estrogen and progesterone have opposing effects on immune response, with estrogen upregulating the response and progesterone downregulating the response. To investigate this relationship we utilized n=24 female rabbits, which as induced ovulators will remain in an estrogen dominant follicular phase unless otherwise stimulated by mating or hormonal treatment. Ovulation was induced in n=12 rabbits with an IV injection of human chorionic gonadotropin (hCG) on day 0 and 14 to produce a 28 day progesterone dominant period. The remaining rabbits received a sham injection (PBS) resulting in an estrogen dominant period of the same length. At the end of this period peripheral blood mononuclear cells (PBMCs) were isolated from whole blood and frozen for subsequent analysis. To assess the impact of hormonal state on peripheral immune compliment, we developed a protocol that consists of fixing and permeabilizing the thawed cells, staining them with various antibodies, and observing our results using a four-color flow cytometer. Cells were fixed with 3.7% formaldehyde and permeabilized with a saponin before staining with various markers to identify total leukocytes, T cells, macrophages, and B cells. We used CD11a and CD45 to identify total leukocytes and CD14 to identify macrophages. We identified T cells by using CD3, and then used CD4 and CD8 to differentiate between helper T cells (CD4) and cytotoxic T cells (CD8). Lastly, B cells were identified by observing which CD3 negative cells expressed fluorescence after being stained with a B cell monoclonal antibody.

Mentor(s):

Alex Pasternak (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 223
Presentation Time: Session 1: 9am-10:30am

Approaches & Challenges of Dance Pedagogy

Author(s):

Sheridan Vik† (Polytechnic Institute)

Abstract:

A dance educator's teaching methodology can either be a steppingstone or a stumbling block to the development of their pupils; this was especially true in the researcher's experience of learning dance. By seeing a gap in her education, she sought out this research project as a way to fulfill that gap. The researcher is a student within Purdue's Division of Dance and is interested in pursuing dance education as a potential career. With her professor's aid, she launched this study into developing her own teaching philosophy and methodology. Through a literature review of contemporary approaches to teaching dance as well as practical teaching labs, the researcher tested approaches to learning, performing, and witnessing dance. The researcher developed and facilitated three, 20-minute dance exercises in a modern dance technique class and two, one-hour classes in modern dance technique to university dance students. The researcher also co-taught four, 30-minute creative movement classes to preschoolers ranging in age from 2 ½ to 5 years old. The researcher received feedback from her professor through teaching evaluation forms and informal discussions. Using written assignments and self-reflections, the researcher developed her approaches to connecting with students, pacing of class, gauging the appropriateness of class content, and selecting effective music accompaniment and teaching props. Through this study, the researcher has developed a teaching philosophy that emphasizes accessibility, excellence, trust, growth, and creativity.

Mentor(s):

Renee Murray (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 224
Presentation Time: Session 1: 9am-10:30am

A Comparison of Pubic Hair Grooming, Genital Image, and Sexual Behaviors Among Heterosexual and LGBTQ+ Individuals

Author(s):

Grace Vukovich† (HHS); Skylar Day† (HHS); Kaylie Katsiris* (Science)

Abstract:

Most pubic hair and genital image research describe cisgender, heterosexual individuals, leaving attitudes and behaviors among LGBTQ+ communities ambiguous. This study aimed to understand pubic hair grooming behaviors and how these behaviors intersected with sexual behaviors, genital image, and sexting during COVID-19 pandemic. Participants (n=619) were a convenience sample of students and employees at a large Midwestern university. Data were collected via a web-based survey. Questions asked related to pubic hair grooming, sexual history, sexting behaviors, and genital image. Chi-square and regression analyses were used for analysis. The mean age of participants was 29.7±11.6 years (range=18-70). Over half (n=384; 62%) reported current pubic hair grooming, with only 55 (8.9%) having no grooming history. Most removed all or some hair using a razor blade for reasons related to hygiene and comfortability during sex. The majority had engaged in partnered (n=388; 62.7%) or solo (n=151; 24.4%) sex, and some (n=46; 7.4%) had sexted over the past year. Preliminary analyses revealed significant differences in grooming and sexual behaviors, sexting, and genital image between heterosexual and LGBTQ+ participants. Findings can guide LGBTQ+ sexual health programs and discussions with healthcare professionals to better understand pubic hair grooming, sexual behaviors, and related behavioral and clinical concerns.

Mentor(s):

Andrea DeMaria (HHS); Chandler Dykstra (Marian University)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 225
Presentation Time: Session 1: 9am-10:30am

The Effects of Progesterone Exposure Prior to Estrous Synchronization in Heifers

Author(s):

Morgan Walsh† (Agriculture, Honors)

Abstract:

Conception in heifers is largely dependent on progesterone exposure prior to estrous synchronization and timed-artificial insemination. The purpose of the study was to evaluate supplemental progesterone at two time points (immediately and 10 days) prior to estrous synchronization using the 7-day Co-synch +CIDR protocol. 92 heifers were randomly assigned to one of three treatment groups: : 7-day Co-synch + CIDR with no presynchronization (CON); 2cc PGF2α (Lutalyse) followed by melengesterol acetate (MGA) feeding for 7d immediately prior to the start of the 7-day Co-synch + CIDR program (PRE); and 2 cc Lutalyse followed by MGA feeding for 7d followed 10 days later by the start of the 7-day Co-synch + CIDR program (PRE+10). Blood samples were collected at CIDR insertion (D0), CIDR removal (D7), timed AI (TAI), and 30 days after TAI (PREG). Heifers in the PRE+10 treatment group had higher levels of progesterone (P=0.0418) at D0 compared to heifers in the PRE treatment group, which was to be expected. Treatments had no significant effect on progesterone levels at D7 (P=0.0749) or TAI (P=0.363). Progesterone values at PREG tended to be lower in the PRE treatment group, suggesting better luteal function in the PRE heifers. The results of this study provide a base for further research to evaluate the PRE treatment with a larger sample size.

Mentor(s):

Kara Stewart (Agriculture); Griffin Nicholls (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 226
Presentation Time: Session 1: 9am-10:30am

Development of Potent and Selective GRK5 Inhibitors and Structural Analysis of GRK5 Bound to Inhibitors

Author(s):

Ellen Wei† (Science); Natalie Galvan* (HHS)

Abstract:

G-protein coupled receptor (GPCR) kinases (GRKs) phosphorylate GPCRs and desensitize them, thereby regulating cell signaling. GRK5 overexpression is found in heart failure and cardiac hypertrophy, and the knockdown of GRK5 in mice embryos has been shown to slow hypertrophy. Furthermore, depletion of GRK5 has been shown to suppress tumor growth in prostate, breast, and non-small-cell lung cancer. For this reason, the inhibition of GRK5 is a potential therapeutic intervention for these diseases. The purpose of this project is to develop potent and selective inhibitors of GKR5. Our lab and our collaborators are developing a series of inhibitors that are derivatives of sunitinib, containing a covalent warhead that can be modified by GRK5, which enhances selectivity for GRK5 versus other kinases. The effectiveness of these compounds in inhibiting GRK5 activity is measured using a radiometric assay. Thus, the extent of inhibition by these compounds on GRK5 activity is revealed by the degree of radioactivity in the product of this reaction, and potency of a compound is assessed by the concentration of the compound required to inhibit GRK5 activity. Currently, several potent and selective inhibitors of GRK5 have been identified. Moreover, we have recently solved a preliminary structure of a potent and selective inhibitor bound to GRK5 using X-ray crystallography, which has allowed for a better understanding of the inhibition mechanism and interaction of GRK5 with its inhibitor. This structural knowledge will improve the design process yielding more optimized inhibitors and will be an advancement in the discovery of new cancer therapeutics.

Mentor(s):

John Tesmer (Science); Yueyi Chen (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 227
Presentation Time: Session 1: 9am-10:30am

What's in a quack? Effects of Pekin duck vocalizations on conspecific physiology.

Author(s):

Serena Wesley† (Agriculture, Honors); Collette Plue† (Agriculture); Isabella Taylor† (Agriculture)

Abstract:

Previous studies have found that different sounds can affect the behavior and overall welfare of birds in captivity. The purpose of our study was to understand how specific Pekin duck vocalizations affect a conspecific's physiological responses. Previously, we found that ducks make 36 different vocalizations. We first collected baseline data on each duck's normal heart rate and blood pressure using a petMAP blood pressure measurement device with a 4 cm blood pressure cuff. Blood pressure (MAP) and heart rate (HR) measurements were taken 10 times continuously on each of the 10 ducks while a researcher held the duck in their lap and then averaged. Respiratory rates (RR) were counted by visualization of the movement of the rib cage. We then played back a common vocalization that both sexes make when in a group, called a long amplitude-modulated (LAM) vocalization, which we recorded previously to determine how that vocalization affects the ducks' HR, MAP, and RR. LAMs are characterized by having more than 8 pulses and are 0.08 seconds or longer. Our initial analyses suggest that the LAM decreased HR and MAP. Vocalizations could be a way to determine overall flock welfare. Further, if we can find vocalizations that have a calming effect on ducks, then those could be played in a commercial barn during periods of stress. The ultimate goal of our research is to develop a non-invasive measure of commercial flock welfare, and vocalizations could be a solution.

Mentor(s):

Greg Fraley (Agriculture); Jeff Lucas (Science); Jenna Schober (Agriculture); Melanie Bergman (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 228
Presentation Time: Session 1: 9am-10:30am

Concrete Encasement Impacts Decomposition of Swine Carcasses

Author(s):

Aubrey Williams† (Science)

Abstract:

There is little data or research into the decomposition process of remains in concrete. The purpose of this is to understand the rate of decomposition of fetal pigs that were encased in Quickrete concrete. Ten fetal pigs were used in the treatment group and one carcass was removed biweekly over the course of four months. A control pig carcass was placed on day 0, and decomposition was documented until skeletonization. A chisel and a 4 pound mallet were used to break open the concrete. Upon removal, photographs were taken to document decomposition and Total body score (TBS) was assessed during observations. Results show that the encased pigs decomposed at a slower rate than the non-encased control which skeletonized within 14 days. After 8 weeks, the encased pigs were in the stages of early decomposition with skin slippage, discoloration, and purging fluids. Due to the results of this study, other methods for accurately determining time of death for remains encased in concrete need to be examined. We propose a novel scale for documenting decomposition and providing TBS for encased remains.

Mentor(s):

Krystal Hans (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 229
Presentation Time: Session 1: 9am-10:30am

Intonational Prosody Is Impaired in Parkinson Disease

Author(s):

Helen Willis† (HHS, Honors); Kaylee Patterson‡ (HHS, Honors); Brianna Coster‡ (HHS); Isabel Pati‡ (HHS)

Abstract:

Intonation is one's ability to convey meaning or emotion by changing vocal pitch (rising/falling patterns). Speech of individuals with Parkinson disease (PD) has been perceived as monopitch and monoloud, potentially reducing intonational contrasts, impacting communication success. However, little is known about how intonation patterns are impacted by PD. The aim of this study is to examine differences in intonation in individuals with PD during a naturalistic intonation task.

Twenty-two people with PD and thirty-four age and sex matched controls participated in the study. A naturalistic intonation task elicited 5 declarative and 5 interrogative sentences. Fundamental frequency (physical correlate of vocal pitch) variation and range were measured to assess intonation patterns.

Based on our initial analyses (22 PD, 34 controls), findings indicate that a greater variability exists in fundamental frequency (F0) for questions when compared to statements for individuals with PD and controls. People with PD demonstrate less variability than controls in questions but not statements..When examining pitch range over the sentence, the analysis demonstrated that questions are produced with a greater range than statements for both groups. Additionally, individuals with PD have a smaller pitch range for questions and statements when compared to controls. Lastly, the analyses show that people with PD are less accurate in producing pitch change (rise during statements and fall during questions) than controls. Overall, the measures show clear evidence of an intonational dysprosody in PD. The reduced variability and pitch range for people with PD likely results in the perception of monopitch and monoloudness.

Mentor(s):

Jessica Huber (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 230
Presentation Time: Session 1: 9am-10:30am

The Effects of Porcine circovirus 3 on Semen Characteristics in Mature AI Boars

Author(s):

Emma Zaicow† (Agriculture)

Abstract:

Porcine circovirus 3 (PCV-3) can negatively affect gestating sows, causing aborted fetuses and stillborn piglets (Saporiti et al.), but little is known about its impact on mature boars. This study aimed to determine if PCV-3 can be detected in the semen of infected boars and what effects it has on reproductive function.

Duroc boars naturally infected with PCV-3 (n=10) and non-infected boars (n=10, 9 months) were utilized in this study over a four-week period. Semen was collected once a week using the gloved hand technique, then centrifuged (10g/5 minutes) for seminal plasma collection. Blood (10cc) was collected via lateral or medial auricular vein while boars were mounted for semen collection on weeks 2 and 4, then centrifuged (3000 RPM/25 minutes) for serum collection. PCR analysis for PCV-3 was conducted on the seminal plasma and blood serum at Purdue ADDL. Semen was analyzed using Computer Assisted Semen Analysis (motility), NucleoCounter (concentration), and morphological assessment (microscopy). The data was analyzed using SAS version 9.4 using PROC MIXED for repeated measures.

Clinical symptoms such as lethargy and inappetence were not observed in any boars. PCV-3 was not detected in the seminal plasma of boars whose blood serum tested positive. Semen motility (P=0.3939), morphologically normal cells (P=0.9163), total sperm produced (P=0.4483), or non-viable cells (P=0.4998) were not different in infected and non-infected boars. PCV-3 was not detectable in semen and did not negatively impact semen production or quality.

Mentor(s):

Kara Stewart (Agriculture); Taw Scaff (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 231
Presentation Time: Session 1: 9am-10:30am

Enhancing Structural Performance of Recycled Fiber-Reinforced Thermoplastic Composite Part Using 3D Printed Continuous Fiber Reinforced Composite Preform

Author(s):

Minjing Zhao† (Polytechnic Institute); FNU Archie‡ (Polytechnic Institute)

Abstract:

The issue of global sustainability has led to increased attention to the recycling of composite materials. From a sustainability perspective, thermoplastic composites are preferred over thermoset composites due to their recyclability. Mechanical recycling, which involves shredding the scrapped composite part and reforming it into different parts, is a commonly used recycling process for thermoplastic composites. In the recycling process, the continuous fibers in the composite are cut into short fibers, resulting to a reduction in mechanical and physical properties. Consequently, recycled composites are not being used effectively due to their devalued properties. To address this issue, this paper proposes a solution involves using a 3D printed continuous carbon fiber composite preform to reinforce the local area, where structurally critical, molded with recycled composite. As a part of geometry, an overhead pin bracket was designed and used. The preform was printed using 60% by weight of carbon fiber reinforced PEKK and printed using the 9T labs continuous fiber printing technology. The preform was designed with consideration to its flow during the molding process to ensure that the continuous fiber was located where required. Three types of recycled composite material were used to make the pin bracket; shredded carbon fiber PEKK laminate, surface-treated shredded carbon fiber PEKK laminate, and shredded 3D-printed carbon fiber reinforced PEKK. The performance of the pin bracket was evaluated by peak stress during the tensile test and compared to a bracket without the preform. The results demonstrated the potential method to enhance the effectiveness of recycling composite materials and compensate for the loss of mechanical strength in recycled composite parts using 3D printed continuous fiber composite preform.

Mentor(s):

Garam Kim (Polytechnic Institute); Eduardo Barocio (Purdue University)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 232
Presentation Time: Session 1: 9am-10:30am

Mapping Global Tree Diameter at Breast Height (DBH)

Author(s):

Xinyi Zhou† (Agriculture, Science)

Abstract:

Diameter at breast height (DBH) is a critical measure of tree size. It can be used to estimate tree volume and biomass, playing an important role in studying forest ecology and economics. However, there has been no attempt to create a global DBH map because current methods for measuring DBH are either via laborious field work or limited to indirect estimation with LiDAR and other optical sensors. To address this limitation, we presented a 3 km spatial resolution global map of the average and standard deviation of DBH based on a global forest inventory database with locally measured data and environmental characteristics, using machine learning and statistical approaches. Our method also identified the most significant environmental predictors of DBH. Our results showed that annual aridity and potential evapotranspiration are the common dominant predictors of DBH across continents. This mapping and the finding based on that are expected to contribute to further studies about the drivers of tree size in forest ecology, therefore improving our understanding of global forest dynamics.

Mentor(s):

Jingjing Liang (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 233
Presentation Time: Session 1: 9am-10:30am

Induction of silent biosynthetic gene cluster by tetracycline antibiotics

Author(s):

Caroline Zu† (Science)

Abstract:

Abstract redacted

Mentor(s):

Elizabeth Parkinson (Science); Lauren Wilbanks (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 300
Presentation Time: Session 2: 11:30am-1pm

Identifying Cars Through Mobile Phone Images

Author(s):

Soham Agarwal† (Engineering, Honors); Om Patel† (Temporary); Jordan Srinivasan‡ (Engineering)

Abstract:

Amidst the variety of automobiles in the contemporary world, it can be difficult for one to easily identify a car. As such, our team is working to develop an application for Android mobile phones that takes in the input of an image of a car and then send that image to a server which will run an algorithm to identify the vehicle's make, model, and production year range, and will reveal statistics any and all statistics that are hardcoded in it. The algorithm first pre-processes the taken image to reduce the processing speed and computational requirements in future steps. Next, the dataset is projected to a dimensionality reduction through Principal Component Analysis for greater accuracy and appropriate data handling. Next, on to the dimensionally reduced data, the algorithm utilizes a trained Support Vector Machine (SVM) model to classify the image into a car category according to the input image's features. Once the server has successfully classified, and thereby, identified the car, the retrieved data and results will be sent back to the user's device for interpretation. It may then be stored along with the date and time it was taken so the user may request this data later.

Mentor(s):

Carla Zoltowski (Engineering); Edward Delp (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 301
Presentation Time: Session 2: 11:30am-1pm

Scalable Extraction of Lutein and Zeaxanthin from WDG

Author(s):

Emily Aicher† (Engineering); Ryan Dreves* (Engineering); Elissa Weinrick* (Engineering)

Abstract:

Bioethanol production is growing as the demand for renewable fuels increases. Production remnants include distiller's grains, both wet (WDG) and dried (DDGS). Both WDG and DDGS contain lutein and zeaxanthin, naturally occurring carotenoids that are necessary for healthy eyes. Currently, lutein and zeaxanthin are recovered from marigold flowers, which require additional processing to increase bioavailability. However, lutein and zeaxanthin derived from corn and corn by-products do not require any additional modification. The present study investigates the yield of lutein and zeaxanthin from WDG and DDGS at both a lab-scale and with a scalable extraction technique. Soxhlet extraction with water, ethanol, and ethyl acetate was investigated as the lab-scale extraction, and pressurized hot water extraction (PHWE) was investigated as the scalable configuration. Extractions were performed for 30, 40, and 50 minutes at 130, 140, and 150°C. Water with either ethyl acetate or ethanol as a cosolvent was used in PHWE. Lutein and zeaxanthin were quantified using a reverse-phase C30 HPLC column and reported on a dry-mass basis. Lutein and zeaxanthin content were used to evaluate extraction efficacy; higher yields indicated better extraction conditions and scale-up possibility. Industrial extraction derives a value-added product from waste grains in the form of a nutritional supplement, thus repurposing waste and contributing to a circular economy.

Mentor(s):

Abby Engelberth (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 302
Presentation Time: Session 2: 11:30am-1pm

Improved Visualization of the Optimal EV Traction Motor

Author(s):

David Amieva† (Engineering)

Abstract:

The electric vehicle (EV) industry has experienced significant growth in response to climate change concerns and the need to lower transportation emissions. Therefore, the environmental impact of EVs is complex and requires careful consideration. The objective of this study is to determine the most sustainable EV motor using an optimization-based model which considers motor mass, energy consumption, and supply risk of its materials. My contribution to this study is to create a 3D parametric CAD model of the motor, which will help visualize how it will change based on the optimization-based model. Currently, the decision was made to choose the surface-mounted permanent magnet synchronous motor (PMSM) for the case study because of its promising attributes. PMSMs are more sustainable than induction motors due to their higher efficiency, power density, and ability to operate at higher speeds without losing efficiency. The main drawback with the PMSM is its reliance on rare earth metals which have limited global supplies and can lead to supply chain issues and price volatility. As these issues are resolved, and as additional analysis and testing are carried out, the optimal model for the PMSM will be solidified.

Mentor(s):

John Sutherland (Engineering); Fu Zhao (Engineering); Jesus Ramon Perez-Cardona (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 303
Presentation Time: Session 2: 11:30am-1pm

Oncogenic KRAS Signaling Elicits an Extracellular Vesicle-Mediated Migratory Phenotype in Non-Tumorigenic Lung Epithelial Cells

Author(s):

David Arteaga† (Science)

Abstract:

Extracellular vesicles (EVs) are small membrane-encapsulated particles secreted by most cell types that carry a variety of bioactive molecules that, when taken up by recipient cells, can alter cell behavior.[1] Previous work has shown that EVs play a unique role in shaping the tumor microenvironment by promoting cell growth, survival, and invasive phenotypes though intercellular communication.[2] In lung cancer, KRAS is the most frequently mutated RAS isoform and mutations in KRAS often produce a constitutively active oncoprotein that results in hyperactive signaling in pathways regulating proliferation, transformation, and survival.[3] Preliminary studies in our lab found that EVs from KRAS mutant lung cancer cells (H358) can increase cell migration in non-tumorigenic lung epithelial recipient cells (HBEC). In this study, we aim to determine whether KRASG12C mutant oncogenic signaling is responsible for the EV-mediated phenotype. To test this, we examine if inhibition of KRASG12C signaling leads to the loss of the EVs ability to induce migration in non-tumorigenic recipient cells. Following treatment of non-tumorigenic cells with EVs derived from KRASG12C inhibited H358 cells, we observed that the EVs lost their ability to drive migration in recipient cells suggesting a novel role of KRASG12C signaling in eliciting pro-tumorigenic properties in recipient cells via EVs. Understanding if mutant KRAS can promote tumorigenic properties via EVs could lead to a new mechanism by which cancer cells regulate the tumor microenvironment to promote tumorigenesis and metastasis.

References

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3. Adderley, H., Blackhall, F. H., & Lindsay, C. R. (2019). KRAS-mutant non-small cell lung cancer: Converging small molecules and immune checkpoint inhibition. EBioMedicine, 41, 711–716. https://doi.org/10.1016/j.ebiom.2019.02.049

Mentor(s):

Andrea Kasinski (Science); Zulaida Soto-Vargas (Science); Humna Hasan (Science); Ikjot Sohal (Science)

Poster Presentation Abstract Number: 304
Presentation Time: Session 2: 11:30am-1pm

ERF, a putative phloem-specific gene is involved in responses to phosphate deficiency in Arabidopsis

Author(s):

Samantha Barker† (Agriculture)

Abstract:

Phosphorus is an essential macronutrient that plays a pivotal role in plant growth and development. However, inorganic phosphate (Pi) deficiency is one of the most limiting factors for crop productivity. When plants experience Pi deficient soil conditions, a series of adaptive responses and alterations happen, including enhanced expression of Pi transporter, prohibition of primary root, and induction of lateral root length, density, and root hair. More specifically, the root architecture in response to Pi deficient soil becomes more branched with the development of axial roots in order to seek out Pi rich soil. The regulation of root system architecture has been claimed to be controlled by local signals generated in roots. In addition to local signaling, systemic signaling has also been found to be involve in Pi deficiency responses. A method called TRAP (translating ribosome affinity purification) was used to profile responsive genes in phloem under Pi deficiency, and this new gene has been identified. In order to characterize the function of one of the new genes in Pi deficiency responses, some experiments have been done, including overexpression of this gene in Arabidopsis, hydroponic experiments to determine phenotype and Pi concentrations in overexpression plants, localization of this gene by GUS staining, and mutation of this gene by T-DNA insertion method. This study is still in progress, and more results will be obtained. However, results of the hydroponics experiments have shown that plants bearing the overexpression of ERF have decreased concentrations of Pi, smaller overall root structure, and have the observed phenotype of purple coloring on the underside of leaves. The presence of the observed results is proof that ERF is involved in the regulation of adaptive responses.

Mentor(s):

Cankui Zhang (Agriculture); Jing Huang (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 305
Presentation Time: Session 2: 11:30am-1pm

Monitoring exposure to small dust particles in the breathing zone of horses while eating hay

Author(s):

Victoria Berch† (Science); Lynn Willems* (Science)

Abstract:

Equine asthma affects almost 80% of horses. In horses, asthma severity may range from mild to severe. Mild cases may only present a slight decrease in performance or occasional coughing. While severe cases cough more frequently and show increased breathing efforts at rest and exercise intolerance. Equine asthma is triggered by exposure to environmental irritants, like hay dust. Dust particle size less than or equal to 10 μm (PM10) can get trapped in the airway and pose a hazard to health. Since horses tend to live indoors for extended periods, it is imperative to lower dust levels. In previous work, we manipulated feeding methods to minimize dust exposure. BB monitors were placed on the horse's halter and real-time values were collected while horses ate for 20 minutes. The BB monitors collected data for PM10 and PM2.5. We hypothesized that there will be no difference in exposure when horses eat from slow feeder hay nets, the Forager, or regular hay nets. The haynet least squares measured the mean for each condition. A 95% confidence interval described the upper and lower mean on a natural logarithmic scale. The mean output for the Forager was 33.7 ug/m3, the slow feeder haynet was 37.3525 ug/m3, and the regular haynet was 33.2050 ug/m3. The data collected is best interpreted as preliminary and should be applied to future tests and studies. Analysis indicates that there is not a significant difference in dust exposure when horses eat under varied conditions.

Mentor(s):

Laurent Couetil (Veterinary Medicine); Katy Ivester (Veterinary Medicine); Laura Murray (Veterinary Medicine)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 306
Presentation Time: Session 2: 11:30am-1pm

Assessing Communication Among Robot-Assisted Surgery Team Members

Author(s):

Allison Biewenga† (Engineering)

Abstract:

Non-technical skills (NTS) such as teamwork, communication, decision-making, leadership, and situational awareness play an essential role in the success of surgical procedures. While surgical staff members receive extensive training in technical skills, NTS training is given less attention. However, these NTS are critical for the success of surgeries, especially with the increased automation in operating rooms (OR) that add extra complexity to procedures. This study analyzes the communication between the assisting surgeon, attending surgeon, and other OR staff. Audio recordings from the surgeons are synchronized with video recordings of various robot-assisted surgeries. A communication coding scheme was developed using both activity theory and common ground theory. The synchronized recordings are compiled and analyzed using the coding scheme. This coding scheme evaluates the exchanges between surgical team members, specifically looking at the motivation, information flow, division of labor, and communication errors, among other attributes. These attributes are scrutinized at specific critical time periods (the time-out call, pre-docking, docking, and undocking of the robot) in robot-assisted surgeries. Through this communication analysis, we plan to develop an objective means of assessing surgeons' communication and non-technical skills. This, in turn, will result in better team outcomes for robot-assisted surgeries.

Mentor(s):

Denny Yu (Engineering); Marian Obuseh (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 307
Presentation Time: Session 2: 11:30am-1pm

Development of an inertial impactor combined with latex agglutination kit to detect airborne legionella

Author(s):

Anthony Bovenschen† (HHS, Honors); Nicholas Pecoraro‡ (HHS, Honors)

Abstract:

Bioaerosols are aerosols of biological origin (e.g. viruses, bacteria, fungi, etc.). Pathogenic bioaerosols, for example, airborne Legionella pneumophila (L. pneumophila) can cause serious diseases. L. pneumophila is a bacterium typically found in standing water where it thrives and reproduces. If the L. pneumophila in the water is aerosolized, it can move through the air, be inhaled by people, and cause Legionnaires' disease (e.g., body pains, nausea, vomiting, fever, headaches, etc.). To protect people against exposure to airborne L. pneumophila, knowing its presence in the air is the first step. The current and conventional methods of detecting the airborne L. pneumophila involve collecting it in the field and then cultivating it in a lab which can be a time-consuming process in a situation that can be time sensitive. To overcome this, we will combine the bioaerosol sampler and L. pneumophila dry spot test kit for rapid analysis. An inertial impactor was designed and built to collect airborne L. pneumophila on the latex agglutination kit. The limit of detection (LOD) of the latex agglutination kit was determined in the lab. L. pneumophila serogroup 1 (ATCC number: 43108) was used. The collection efficiency of the developed impactor was also determined using the salt particles. Specifically, salt solution was sprayed and their concentrations upstream and downstream were measured. The LOD of the test kit was 87222 cells per test kit. The results indicate that the development method can be used in a high-concentration environment.

Mentor(s):

Jae Park (HHS); Subin Han (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 308

Presentation Time: Session 2: 11:30am-1pm

Microstructural Properties of Irradiated Alloys

Author(s):

Evan Carr† (Engineering); Peter Suarez† (Engineering)

Abstract:

Authors:

Peter B. Suarez, College of Engineering

Evan D. Carr, College of Engineering

In alloys, Widmanstätten structures, which are also known as lamellar structures, are plate-like formations within the material that can increase toughness by reducing crack propagation, but can also increase the chances of failure by creating stress concentrations. Zirconium, an element that is key in many modern nuclear reactor systems, tends to form these plate-like structures in alloys. The goal of understanding the properties and processes of formation of Widmanstätten structures is to increase longevity of zirconium alloys in extreme reactor conditions. We aim to identify other alloy systems and fabrication processes that form Widmanstätten structures, creating a more cohesive understanding of this microstructure. Trends are being identified through a literature review of niobium-zirconium and other alloys that form Widmanstätten structures. Trends of Widmanstätten structure formation and properties will be grouped by similarity and compiled into a general understanding. Prior research has determined that these plate-like structures form from slow cooling from high temperatures and are born at the grain boundaries. Identifying trends in Widmanstätten structures will allow these structures to be used to improve alloy performance. The impact of varying lengths and widths of the Widmanstätten plates on the swelling of uranium-zirconium fuel pellets or on improving mechanical properties for niobium-zirconium alloys used in fuel cladding will be observed in future experiments.

Mentor(s):

Janelle Wharry (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 309
Presentation Time: Session 2: 11:30am-1pm

Testing Iron Nanoparticle Sensitivity to 4T1 cells using Trypan Blue Clonogenic Assay

Author(s):

Kaubfar Changkanjana† (HHS); Talia Thornton‡ (HHS, Liberal Arts); Sidney Schwartz‡ (HHS)

Abstract:

The purpose of this study was to use Trypan blue clonogenic assay to test iron nanoparticle exposure to mammary carcinoma 4T1 cell lines. 4T1 cells have the ability to metastasize into tumors and mimic very closely to human breast cancer. This study involved separating irradiated 4T1 cells in to 3 different flask each consisting of a different dosage of iron radiation (0 Gy, 2 Gy, and 8 Gy). This clonogenic assay technique is in vitro and enables differences in reproductive viability from a single cell forming into a colony while the Trypan blue method stains the membranes of dead cells and allows us to count them using the hemocytometer. The exponential growth of both the living and the dead cells in the doses of radiation performed proved the efficiency of how the 4T1 cells reacted to iron radiation. An approximation of 80% confluence was necessary for this experiment, and results highlighted that the highest cell viability was found at 2 Gy exposure. Moreover, devoting additional levels of radiation exposure and calculating the cell viability using Trypan Blue assay could improve our results to how the 4T1 cells behave over a certain period of time.

Mentor(s):

Matthew Scarpelli (HHS); MacKenzie Coon (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 310

Presentation Time: Session 2: 11:30am-1pm

Next generation, room temperature liquid metal for semiconductor cooling

Author(s):

Timothy Chen† (Engineering)

Abstract:

Nearly 60 years since its first proposal, Moore’s law still holds in predicting the growth of complexity in integrated circuits. With increasing power density in microelectronics, the need for better thermal management becomes more and more important. With these issues in mind, gallium and its alloys stood out as a good option of thermal interface material due to its high thermal conductivity, large working temperature range, and it being liquid at room temperature. Our objective is to optimize properties such as wettability and thermal conductivity through adding other filler materials or alloy metals. In this project, we chose eutectic Ga-In (21.8 wt% In) as the base liquid metal to perform further modification on for its low melting temperature (15.5°C). By preparing different substrates and preparing the eutectic Gallium Indium, we can perform different wettability and thermal conductivity measurements and experiments. Based on our findings, although liquid metal alloy for chip cooling is still in the developing stage, the liquid metal can become a thermal resistance reduction material for industrial use. To reach the goal of ultimately becoming the next generation semiconductor cooling material, further research in corrosion and erosion prevention and discovering measuring techniques for coolants needs to be conducted.

Mentor(s):

Carol Handwerker (Engineering); Yifan Wu (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 311
Presentation Time: Session 2: 11:30am-1pm

Color Design and Infographics of the RGB and HSB Color Systems

Author(s):

Coco Chen† (Liberal Arts); Maya Francisco† (Liberal Arts, Management); Mary Neuman† (Liberal Arts)

Abstract:

Abstract:

Media arts and visual design students work with colors on the computer screen based on two fundamental systems: The RGB color model and the HSB color system.They are scientific models to represent the dimensions of color and are the most common methods for creating and selecting colors for art and design applications. . For this design-based project, Wilke interns are designing several informational graphics, including digital animations, to visually present these digital color systems. The purpose of the informational graphics is to organize and present digital color information and theory based on a visual method to facilitate the understanding of color attributes. These graphics will help students recognize color attributes, select and create colors digitally. The following informational graphics and illustrations are being developed: 1) HSB color planes visualization animation based on the RGB/CMY digital color wheel, 2) Nature-based RGB color wheel representation, 3) 3D model animation of the RGB Cube, 4) Slide tray animation of the RGB Cube, 5) Illustrations representing saturation, brightness, and various tonal scales, 6) Digital color atlas based on 30 hue planes. These informational graphics and illustrations will be integrated into Prof. Bendito's Digital Color Wheel Study Guide.

References:

Colorist. Shigenobu Kobayashi

Encyclopedia of Design volumes 1 and 2

Collaborative work of Petronio Bendito, Mary Neuman, Maya Francisco, and Coco Chen

Mentor(s):

Petronio Bendito (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 312

Presentation Time: Session 2: 11:30am-1pm

Investigation of fiber content, fiber direction, and surface characteristics of different surface angle of additively manufactured composite relative to the printing direction

Author(s):

Sung Jun Choi† (Polytechnic Institute); Harry Lee* (Engineering, Honors)

Abstract:

Extrude Deposition Additive Manufacturing (EDAM) is a widely used 3D printing technology for thermoplastic composite materials. Pelletized composite materials are melted in an extruder and deposited layer by layer onto a building plate through a printing nozzle. In the printing process, the majority of fibers align with the printing direction. One of the significant applications of 3D printed composites is for building composite part manufacturing tools. The surface characteristics of the tool play an important role in determining its durability, the surface finish quality of composite parts, and the required demolding force for composite part manufacturing. The orientation of the fiber on the tool surface changes with the tool surface angle relative to the printing direction. The surface characteristics influenced by the fiber orientation can vary depending on the surface angle relative to the printing direction. Therefore, understanding the surface properties resulting from different surface angles is essential. In this study, an acrylonitrile butadiene styrene (ABS) composite block filled with 20% carbon fiber by weight was printed using EDAM technology. Surface property test specimens were cut along different planes (1&2 plane, 2&3 plane, and 1&3 plane while 1-printing direction, 2-traverse direction, and 3-stacking direction) and observed under a microscope for fiber content and orientation. The specimens were then finished using a computer numerical control (CNC) milling machine to achieve the desired testing surface. Surface characteristics critical for composite tooling applications, such as surface hardness, abrasion resistance, roughness, and friction, were evaluated.

Mentor(s):

Garam Kim (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 313
Presentation Time: Session 2: 11:30am-1pm

Developing a high throughput screening system based on fluorescence for Lysostaphin activity

Author(s):

Kashif Chowdhury† (Science)

Abstract:

Infections caused by Staphylococcus continue to be a problem worldwide both for human and animal health. Due to the overuse of antibiotics for various infections, multiple strains of different bacteria are gaining resistance and becoming increasingly more difficult to treat. Lysostaphin are bacteriocins naturally produced by S. simulans, which exhibit a high degree of antistaphylococcal bacteriolytic activity. It cleaves the pentaglycine cross bridge of S. aureus peptidoglycan causing it to lyse and therefore has the potential to act as a natural antibiotic. The usage of lysostaphin for this application is however hindered by its low stability and activity. These properties can be improved by directed protein evolution, a method that uses iterative rounds of mutations and screening to obtain a protein of desired properties. Developing the right screening system, reflecting the property of interest, is very important for successful protein engineering. Classical screening systems based on microtiter plates are medium to low throughput, time-consuming and expensive. In order to obtain a higher throughput, researchers often resort to the use of surrogate substrates due to their ability to be coupled with the release of fluorescence. However, this process leads to the selection of protein variants with activity against the surrogate instead of the real-life substrate which might behave differently. To avoid these pitfalls, we are developing a screening system based on fluorescence using Staphylococcus cells, therefore allowing us to combine the advantages of high throughput screening based on fluorescence while using the natural substrate, i.e. Staphylococcus Aureus.

Mentor(s):

Raluca Ostafe (Purdue University)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 314
Presentation Time: Session 2: 11:30am-1pm

Alternatives to Leaded Solder

Author(s):

Ethan Christie† (Engineering)

Abstract:

Alternatives To Leaded Solder

Prolonged exposure to Lead is very hazardous to the human body. It can cause irreversible damage to the brain and nervous system, which can result in harm to growth and development. In an effort to prevent this, Lead was removed from solder in the 2000s for consumer goods. Other industries, such as military applications, have not yet made the switch due to extreme environments and reliability concerns. The push to utilize lead free solder has caused an increase of interest for testing non-leaded solders in military applications. We can test various solder products, with varying compositions and scenarios, to find one suitable to the military's standards. Tests such as thermal testing and other types of stress testing have yielded promising results, that non-leaded solder is a potential viable alternative leaded solder. Some varieties of non-leaded solder are able to result in similar electrical conductivity, offer enough resistance to damage, and are able to withstand extreme temperatures similar to currently used varieties of leaded solder. In conclusion, there is a push to remove leaded solder from the military. There is a need to make sure this is a viable transition, due to the extreme environments the military has to operate in. As such, massive amounts of testing needs to be done, and currently, it is looking viable.

Mentor(s):

Carol Handwerker (Engineering); Lijia Xie (Engineering); Hannah Fowler (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 315
Presentation Time: Session 2: 11:30am-1pm

Depression predicts subjective health but not mortality in middle-aged and older adults

Author(s):

Quinn Clemenz† (Science)

Abstract:

Chronic conditions are part of many people’s lives, especially as they age, and number and severity of chronic conditions predict greater risk of mortality. Importantly though, there are differences in mortality between individuals with similar chronic conditions, but the reasons for these differences are unclear. We recently showed that at similar levels of chronic disease burden, people who rate their health better have lower mortality risk than people who rate their health worse. In this study, we examine the role of depression as a potential explanation of the links among these factors since depression also increases mortality risk. We hypothesized including depression in the analytical model would reduce the magnitude of the interaction between self-rated health (SRH) and chronic conditions. Data were from the second wave of the Midlife in the US (MIDUS study;) N = 5,516). Chronic conditions were weighted by their ability to cause disability and SRH was measured on a scale from 1-5 where 1 = poor and 5 = excellent. Depression was measured using the Composite International Diagnostic Interview (CIDI); a dichotomous variable created to indicate potential depression. Results from the logistic regression model showed that depression did not affect the interaction between SRH and chronic conditions in predicting mortality. However, people with depression were significantly more likely to rate their health worse compared to people without depression (< 0.001). While depression is clearly associated with subjective perceptions of health, it does not contribute to the links among SRH, chronic conditions, and mortality.

Mentor(s):

Elliot Friedman (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 316
Presentation Time: Session 2: 11:30am-1pm

Validation of Behavior and Performance of a RISC-V Based Microcontroller

Author(s):

Brandon Cole† (Engineering); Zhuokun Liu† (Engineering); Rohan Gangaraju† (Engineering); Devin Singh† (Engineering)

Abstract:

AFTx07 is a RISC-V based microcontroller developed by the Purdue System on a Chip team preparing for tape-out. This research group worked on preparing the chip for tape-out by using a multitude of software tests and benchmarks to verify the behavior and performance of the chip. A suite of functional software tests was developed to ensure that new additions to the RISC-V core properly behaved. Improvements over the previous AFTx06 design were also tested for correctness. The EmBench suite of benchmarks designed for embedded processors was adapted to work with a simulation of AFTx07. These benchmarks provided insight into the performance changes from new features such as the three-stage pipeline and increased clock speed. The AFTx07's results normalized to 1 Mhz were comparable to a consumer-ready ARM STM32F4 Cortex-M4 at 18 Mhz. The internals of the chip's Inter-Integrated Circuit (I2C) communication bus have been improved and tested using a simulated testbench. These improvements will allow for easier communication with the chip once it is taped-out. Options for off-chip memory have been explored for use in packaging, and a memory controller block has been developed for the chosen memory. This addition will allow us to use the chip for more memory-intensive applications. All of these improvements to AFTx07 before fabrication will allow for easier simulation, validation, and architectural improvements in the future through FPGA emulation, extensive software testing, and performance optimizations.

Mentor(s):

Cole Nelson (Engineering); Mark Johnson (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 317
Presentation Time: Session 2: 11:30am-1pm

Construction of a Synthetic Genetic Switch Circuit Utilizing Recombinase Bxb1

Author(s):

Grace Cook† (Agriculture, Engineering, Honors)

Abstract:

Previous work has computationally indicated the viability of creating genetic oscillators using recombinases. In order to begin the characterization of such a genetic oscillator, we set out to construct switchable circuits. Recombinases are a class of proteins that are able to cleave and rejoin DNA at specific sequences. Serine integrases are a useful sub-family of recombinases in the design of a synthetic switch or oscillatory circuit. Their mechanism of action allows them to use a recombination directionality factor (RDF) to reverse the rearrangement of DNA. Each individual serine integrase has a paired RDF. We utilize the serine integrase Bxb1 and its complementary Bxb1-RDF to flip the directionality of a promoter. This leads to the formation of one of two different fluorescent proteins, GFP and mScarlet. 3G Assembly is used to construct the circuits. 3G Assembly is a modular cloning workflow combining the use of Golden Gate Assembly to create transcriptional units (TUs) from individual gene parts, polymerase chain reaction (PCR) to amplify the TUs, and Gibson Assembly to put the TUs into plasmid backbones. The construction of these preliminary circuits will allow for further tuning of oscillatory behavior as well as the construction of circuits capable of switching between the expression of different therapeutics.

Mentor(s):

Leopold Green (Engineering)

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Poster Presentation Abstract Number: 318
Presentation Time: Session 2: 11:30am-1pm

Studying the C959X mutation of the SCN2A gene through human organoids.

Author(s):

Erin Creager† (Science)

Abstract:

Mutations in the SCN2A gene cause dysfunction in the NaV1.2 channel, resulting in impaired neuronal activities which are strongly linked to neurological disorders such as epilepsy and autism. Different mutations render various changes in neuronal excitabilities, sometimes even opposite phenotypes. SCN2A-C959X, known as a loss-of-function (LoF) mutation, is associated with severe autism in the clinic. It is urgent to determine how the SCN2A-C959X mutation affects neural activity, thus shining a light on alleviating the impairments. Three-dimensional (3D) organoids developed from human induced pluripotent stem cells (hiPSC) are used since they have a high long-term survival rate in vitro and closely model a human brain in vivo which creates an ideal model for studying neurological disorders. However, how the SCN2A-C959X mutation affects neural activity in 3D brain organoids remains unknown. To begin, separate cortical, striatal, and midbrain spheroids are generated from hiPSC cells. Characterization of specific neuronal markers using immunofluorescent techniques is then performed next to verify the specific features of the organoids. Additional patch-clamp techniques are then used to record the neural activity of the organoids. Ultimately, a lower firing rate of spontaneous excitatory postsynaptic currents (sEPSCs) is discovered in the SCN2A C959X mutation. Our study may advance the understanding of physiopathology and treatments for these patients carrying LoF SCN2A mutations.

Mentor(s):

Yang Yang (Pharmacy); Xiaoling Chen (Pharmacy); Jingliang Zhang (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 319
Presentation Time: Session 2: 11:30am-1pm

Understanding the Electrochemical Performance of Heptyl Viologen in Host-Guest Complexes

Author(s):

Ronald Cutler† (Science)

Abstract:

Viologens are molecules that can undergo up to two electron transfers with each oxidation state conferring a particular color to the solution they are dissolved in. This property makes them suitable candidates for the preparation of electrochromic devices. The color change viologens undergo at different voltages can be tuned by changing the alkyl chains attached to the bipyridine center. However, this reduces their solubility and complicates analysis in an aqueous solution. A strategy to enhance the performance of derivatized viologens is to incorporate them into a suitable host molecule that will stabilize them in solution. Cyclodextrins are neutral cyclic polymers made of glucose subunits that incorporate viologen into their hydrophobic interior. Cucurbiturils are another type of cyclic host molecule, featuring a negatively charged rim which provides a favorable environment for positively charged viologens. In this work, we use heptyl viologen as a model system with poor solubility and a complex electron transfer mechanism to show how its electrochemical performance is changed by using host-guest chemistry. Specifically, we measure the electron transfer properties of heptyl viologen with α-cyclodextrin and cucurbituril-6 using two electrochemical techniques: cyclic voltammetry and square wave voltammetry. With cyclic voltammetry, we will determine basic electrochemical performance parameters. In addition, we use a more sensitive square wave voltammetry technique to gain more information on the complex electron transfer mechanisms of the systems. Collectively, these techniques provide a robust characterization of the electrochemical properties of heptyl viologen and how those properties are influenced by the formation of host-guest inclusion complexes.

Mentor(s):

Julia Laskin (Science); Hugo Samayoa-Oviedo (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 320
Presentation Time: Session 2: 11:30am-1pm

Intro to SoCET: Overview of the Different Aspects of System-on-Chip

Author(s):

Soumalya Das† (Engineering); Andy Lin‡ (Engineering); Sitara Iyer‡ (Engineering); Vijay Tummalapenta‡ (Engineering); Lucas Manalo‡ (Engineering)

Abstract:

The purpose of this research is to explore the different aspects of the various tools that are used in the stages of planning, designing, and implementing a system-on-chip, which is a circuit that integrates most or all components of an electronic system. The main topics of our research include Git, Linux commands, interchanging between Boolean algebra and logic gates, finite state machines using combinational and sequential logic, computer architecture, SoC (System-on-Chip) architecture, and schematic/layout design. In the research conducted, the different areas we have explored are programming in Verilog, creating a schematic and transferring it into a layout, and investigating deeper analog concepts. To better understand these concepts, we engage in weekly labs that require a comprehensive understanding of each module. These modules cover a broad range of disciplines, from programming to digital design to physical design to analog design. This assisted us in obtaining a brief understanding of the different phases of producing a system-on-chip. It can be said that this project is a detailed overview of each of the sub-teams of the VIP (Vertically Integrated Projects) SoCET (System-on-Chip Extension Technologies) team.

Mentor(s):

Mark Johnson (Engineering); Jude Pinto (Engineering); Cole Nelson (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 321

Presentation Time: Session 2: 11:30am-1pm

PnuC-like Nicotinamide Riboside Transporter in the Bacteriophage NedWong

Author(s):

Lauren Davern† (Agriculture, Engineering); Annika Patel† (Engineering); Reagan Long† (Engineering, Science); Carissa Chane† (Education, Science); Christiana Whittey† (Science); Brooke Yorio† (Engineering, Honors); Natasha Macarchuk† (Engineering); Maya Driscoll† (Engineering); Sarina Lee† (Engineering); Ben Goncher† (Engineering)

Abstract:

Bacteriophages are viruses that infect bacteria and vary in size, morphology, and genomic organization. For this reason, bacteriophages are considered the most profuse and diverse organisms on Earth despite only targeting and infecting bacteria for survival and reproduction. Current studies are focusing on the development of bacteriophage-based tools for therapeutic, clinical, and diagnostic use while academic institutions encourage discovery-based undergraduate bacteriophage research through the SEA-PHAGES program. As a result, the 104,085 to 155,173 base pair region of the bacteriophage NedWong was annotated by ten student researchers at Purdue University to identify genes within the region and to determine the function of each gene. The program DNA Master and sources such as Phamerator, HHPred, Starterator, and PhagesDB suggested that the function of bp 135,618 - 135,920 is PnuC-like nicotinamide riboside transporter (PnuC-like NRT), a class of membrane transporters that catalyze cellular uptake of the NAD+ precursor nicotinamide riboside. PnuC-like NRT has potential for medical applications as it plays an important role in the onset of human age-related diseases such as diabetes, liver disease, and mitochondrial myopathy. Therefore, further research on the function of the base pair region could provide a better understanding on how bp 135618 - 135920 contributes to the overall function of the bacteriophage, and the potential biotechnological and pharmaceutical applications of NedWong and other membrane proteins.

Mentor(s):

Kari Clase (Agriculture); Harry Ashbaugh (Engineering); Amanda Blankenberger (Engineering); Morgan Gyger (Engineering); Rebecca Mold (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 322

Presentation Time: Session 2: 11:30am-1pm

Assessing the effect of small molecule activators and inhibitors on the activity of the HYPE/FicD in neurodegeneration.

Author(s):

Lukas Dolidze† (Science); Kevin Ryu† (Science)

Abstract:

Accumulation of abberantly folded proteins is a hallmark of several neurodegenerative diseases. For instance, Parkinson's Disease (PD) is associated with the aggregation of the α-synuclein pre-synaptic protein. Our lab discovered that α-synuclein can undergo a chemical modification called adenylylation (AMPylation), carried out by the sole human Fic (Filamentation induced by cyclic AMP) protein HYPE (Huntingtin yeast interacting protein E). AMPylation decreases the neurotoxic phenotypes of PD, thus making HYPE an promising novel candidate for therapeutic intervention. Additionally, we found that HYPE controls the cell's ability to cope with misfolded proteins via tightly regulated AMPylation and de-AMPylation of the chaperone BiP, which is critical for refolding misfolded proteins. Therefore, we developed a high-throughput fluorescence polarization assay to screen chemical and small molecule compound libraries (DIVERSet™ ChemBridge and CNS-Set™ ChemBridge) for activators and inhibitors capable of penetrating the blood-brain barrier that could manipulate HYPE's dual AMPylation/de-AMPylation activity. Using our top hit compounds, we will test their effects on modulating the enzymatic activity of two clinical mutants of HYPE, named R371S and R374H, which were recently reported to be associated with motor neuron defects caused by increased levels of AMPylated-BiP. We hypothesize that one or more of our identified inhibitors of HYPE activity could be used to reduce BiP AMPylation in patient with HYPE mutations, while activators of HYPE would be beneficial for treating early onset PD.

Mentor(s):

Seema Mattoo (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 323
Presentation Time: Session 2: 11:30am-1pm

Visual Odometry in Simultaneous Localization and Mapping for Unmanned Aerial Systems

Author(s):

Alice Dragnea† (Engineering)

Abstract:

Search and Rescue operations can be risky for first responders as they are faced with unfamiliar and potentially unsafe environments. We are implementing part of the Simultaneous Localization and Mapping (SLAM) algorithm for a drone which would aid first responders by scouting indoor structures to detect survivors as well as potential hazards. The algorithm constructs a map of the environment using landmarks while simultaneously tracking the drone's position. Bag of Visual Words (BOVW), visual odometry, and loop closure are used to keep track of landmarks and the drone's position, allowing the SLAM algorithm to appropriately update the map of the drone's environment. The drone uses OpenCV Feature detection, through Speeded Up Robust Features (SURF) to represent images as BOVW, allowing us to distinguish unique landmarks and implement loop closure. The drone will perform stereo visual odometry through our depth camera to allow it to detect distance traveled and location based on changes in frames. The implementations will be made using Python and ROS2 nodes.

Mentor(s):

James Goppert (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 324

Presentation Time: Session 2: 11:30am-1pm

The Evolution of Callose Synthase in Green Plants

Author(s):

Giovanna Durante† (Science, Honors)

Abstract:

Callose is a β-1,3-glucan polymer present in plants which has been identified as a crucial player in the plant responses to pathogen attacks. This polysaccharide/carbohydrate controls infections by creating a physical barrier at the plant cell wall and plasmodesmata of sieve tubes, inhibiting the spread of infections into additional plant tissues. Callose synthase is the enzyme that is responsible for the synthesis of this critical polymer. Previous studies have examined the evolution of callose synthase in pollen development. However, neither the evolution of callose synthase in plant responses to pathogens, nor its function across green plants has yet been investigated. This study aims to explore the callose synthase family across green plant species to gain insight into how plant immune systems evolved through their 500 million year evolutionary history. To achieve this, 30 plant genomes that represented different plant groups were analyzed. A BLAST search using previously characterized Arabidopsis callose synthase genes as the query, identified 346 unique callose synthase homologs. Multiple sequence alignment through the MAFFT program revealed the relationship between these homologs. The resulting sequences were trimmed and used to build a phylogenetic tree using the maximum-likelihood estimation. This phylogeny showed that green algae forms a clade by itself, and that the remaining six callose synthase clades contain only land plant taxa, suggesting that the function of callose synthase diverged after the landing process of plants. The additional changes between clades show significant patterns in the modifications of the proteins and pathogen defense strategies over time.

Mentor(s):

Chao Cai (Libraries)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 325
Presentation Time: Session 2: 11:30am-1pm

Engagement and Outreach Through On-Demand Video

Author(s):

Wesley Dynlacht† (Liberal Arts)

Abstract:

The purpose of this research opportunity was to connect with local clientele to produce video content that can be accessible via QR code in an effort to create an efficient and effective means of sharing video content from any location. Video content was acquired and edited through many channels in a multi-month long process across two semesters. This process yielded what will be twelve roughly 30-second videos highlighting some of the murals that can be found across Lafayette, Indiana. From there, QR codes will be utilized to launch the videos at the sight of the mural, providing immediate access to convenient and interesting information to onlookers about the piece they are looking at. The implications of this research are profound and numerous as the opportunity for quick access to video content only continues to rise in both necessity and popularity. Ideally, this research can be applied to Purdue's own campus in a similar fashion - that being the sights, sounds, and traditions of Purdue having the opportunity to have further explanation and information via QR code videos in their respective locations.

Mentor(s):

Bobby Chastain (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 326
Presentation Time: Session 2: 11:30am-1pm

Safety IoT (software)

Author(s):

Garret Eatinger† (Engineering); Vaishakh Deshpande† (Engineering); Tyler Lagowski† (Engineering); Brandon Liu† (Engineering)

Abstract:

Safety is the number one concern in all fields of work. All devices that can give warnings and report dangerous situations are a requirement in any building. The smoke detector being the most famous of these devices, used for the simple task of alarming when smoke is detected in a room. In its more complicated forms, it can alarm all connected detectors and even immediately notify a local fire department about the situation. Our motivation with this Safety IoT device is to further the function of the famous smoke detector via a number of high quality sensors measuring a multitude of different data points.

This branch of the project is focused on the software side of the device, therefore we won't point to the physical or machine learning aspect of the project. The major bridge to cross in this branch was the communication between the RaspberryPi, BlackPill microcontroller, and the array of sensors. This is accomplished using a serial connection between the Blackpill and Orangepi combined with I2C for sensor data collection.

The results of this branch is the collection and storing of the sensor data in a useable database. The database is given to the machine learning team for them to further their models for our team to later implement as a danger prevention method. Our team is confident that this project has been a good display of what can be improved in safety devices with a path for further improvements.

Mentor(s):

Matthew Swabey (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 327
Presentation Time: Session 2: 11:30am-1pm

Modeling High Efficiency Thermophotovoltaic Systems

Author(s):

Kai Ze Ee† (Engineering)

Abstract:

Thermophotovoltaics (TPVs) have significant potential for a wide range of applications, for instance, they can be used with fuel combustion, high-temperature industrial processes, thermal barrier coating (TBC) and thermal energy grid storage. TPV systems transform thermal energy into thermal radiation through the emitter, then convert it into electrical energy through the TPV cell itself. However, for TPVs to be economically viable for a broad range of applications, they need to break efficiency and cost thresholds to disrupt the industry standard of power generation – the steam turbine. To increase the efficiency of thermophotovoltaic cells, electrical output must increase or heat loss, due to inefficiencies, must decrease. A solution is improving the emitter's performance through testing and analysis of its material candidates. A specific emitter's properties can be recorded using an ellipsometer with an integrated TSEL1000 heating cell (J.A. Woollam company). Measured values of temperature dependent – room temperature to 1000C - refractive index and thickness values within the ultraviolet to near infrared wavelength regions are obtained through tests. With the data, the Stanford Stratified Structure Solver (S4) tool on nanoHUB.org is used to model the reflection and transmission flux at specific wavelengths of light. The model's data is then compared to the collected data to quantify the error. After analysis, the model undergoes further refinement to be used in future studies improving the emitter design. This modelling technique can also be used on multilayer emitters with greater spectral control, thus, resulting in enhanced emitter designs regarding conversion efficiency.

Mentor(s):

Peter Bermel (Engineering); Jie Zhu (Engineering); Changkyun Lee (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 328
Presentation Time: Session 2: 11:30am-1pm

Biodegradable drinking straws based on thermoplastic starch-pulp composite

Author(s):

David Estrella† (Engineering)

Abstract:

The world produces around 400 million tons of plastic yearly, exploiting the modern manufacturing process with the advantages proposed by this material. Single use plastics, such as fossil fuel-based straws, result in environmental buildup that will negatively affect the next generations of life and the ecosystem. Many organizations have attempted to replace this commonly used plastic through paper, bamboo, or even avocado seed straws, but they all end up damaging the ecosystem anyway; be it through more harmful manufacturing or not enough biodegradability. Using a material-engineered biodegradable plastic may set a definitive model of a straw, and therefore a plastic, that is easily manufactured, non-damaging to the environment, and just as comfortable to use as the traditional plastic (straws). This project explores a bioplastic composite called thermoplastic starch (TPS), and the study of its components' contribution to the final synthetization. The main component in TPS is the use of cellulose nanofibers (CNF), a wood-derived pulp micro-refined to several hundredths of a micron (in the nano level), making it one of the most advanced biomass nanotechnology materials that exist today. CNF provides a structure of high tensile strength in high tensile strain with hydrophobicity. It is applied to gelatinized corn starch, and added glycerol and citric acid as plasticizers, which is then heated to start crosslinking. Once a successful and replicable straw batch is perfected, there is feasibility for replacements for plastic in most other areas of single use plastics, which has potential to extricate the ecosystem in great measures.

Mentor(s):

Jeffrey Youngblood (Engineering)

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Poster Presentation Abstract Number: 329
Presentation Time: Session 2: 11:30am-1pm

Residual Stresses in the Mineralized Collagen Fibril

Author(s):

Samantha Ferengul† (Engineering)

Abstract:

This study focuses on the mechanical interactions between bone mineral and collagen. We consider the processes of mineralization and hydration. Mineralization expands the volume of the mineral phase while hydration expands that of collagen compartments. The evolution of microlevel residual stress interactions were analyzed using the finite element method and a micromechanical representation of the composite of mineral and collagen. The analysis was conducted with the code ABAQUS. Anisotropy in the collagen matrix is accounted for. The simulations demonstrate the development of tensile vs. compressive stresses in mineral and collagen phases. This work contributes to advancing knowledge on bone failure. Its broader impact contributes to potential advances in health outcomes in fracture reduction in the aging population.

Mentor(s):

Thomas Siegmund (Engineering); Elizabeth Montagnino (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 330
Presentation Time: Session 2: 11:30am-1pm

Radiation Effects Testing of Multilayered Boron Nitride-Tungsten Hybrid Shield

Author(s):

Aaron Fernandes† (Engineering); Andres Gomez‡ (Engineering); Elizabeth Bradshaw‡ (Engineering); Elliot Wong‡ (Engineering)

Abstract:

Outer space is a harsh environment, which includes hazardous radiation, extreme temperatures, atomic oxygen, and high vacuum. With space missions increasingly relying on advanced electronics, these critical components must be protected from space conditions, particularly ionizing radiation. Cosmic radiation is made up of X-rays, fast neutrons, and gamma rays. Fortunately, harmful effects of radiation on microelectronics and people can be greatly reduced by materials with appropriate radiation shielding properties. However, no one material can easily protect against all the types of radiation seen in the space environment. Therefore, the objective of this project is to evaluate the radiation shielding capabilities of a multilayered shield composed of boron nitride and tungsten. Boron nitride is known to absorb neutrons, and tungsten is known to effectively block gamma rays and X-rays. This multi-material structure is effective due to its ability to shield both types of radiation. In particular, space applications demand lightweight, affordable, and protective radiation shields to protect the electronics. We will perform tests to optimize the shielding effectiveness of this shield. The experimental shield is tested by measuring the fraction of radiation that penetrates through the shield when exposed to X-ray/gamma ray sources as well as fast neutron sources that are representative of those present in outer space. Numerous configurations will be tested to determine the optimal thickness and order of each layer. Future studies will further assess the structural integrity and behavior of these materials under extreme temperatures, and consider alternative materials and fabrication strategies.

Mentor(s):

Peter Bermel (Engineering); Allen Garner (Engineering); Stylianos Chatzidakis (Engineering); Charles Grey (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 332
Presentation Time: Session 2: 11:30am-1pm

Enhancing Wellness and Self-efficacy through Targeted Interventions for Vulnerable Populations

Author(s):

Kylee Gall† (HHS, Honors)

Abstract:

The elderly population often depends on external mechanisms of support to maintain wellness. The reciprocal nature of this dependance increases as age advances and mental and physical health deteriorates. Research has shown one's ability to participate in their daily care alone helps to foster mental and physical wellness yet when coupled with meaningful enrichment activities such gains are further compounded. Fostering a sense of control is a critical component on their path toward lasting wellness yet moving the needle in this direction requires the incorporation of a diverse set of activities with paired supplementation. This study aims to investigate the impact of targeted enrichments with linked post-session supplementation on enhancing the overall wellness and subject self-efficacy. The study will consist of partnering with staff at a community site to implement enrichment activities with the elderly population. We will provide both environmental and group enrichment that focus on amplifying community connection, enhancing self-efficacy, and promotion of overall wellness of subjects. We will also provide residents resources to engage in an enrichment activity on their own. Following the enrichment, we will survey the staff at the community site to determine whether the aforementioned gains are noticed at an appreciable level in their residents following the intervention. The expected outcome of this research is that the staff at the community site will notice an increase in engagement, self-efficacy, and wellness in the population they serve. We expect that providing the subjects with materials will increase the impact of the learned enrichment activity.

Mentor(s):

Lisa Hilliard (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 333
Presentation Time: Session 2: 11:30am-1pm

The phenotypic consequence of CRISPR-Cas9 mediated deletion of VAT1 in angiosarcoma

Author(s):

Lauren Gartenhaus† (Science, Honors); Mae Shu‡ (Science, Honors); Emma Terwilliger‡ (Science, Honors)

Abstract:

Angiosarcoma (AS) is an aggressive vascular cancer in which the genetic drivers of the disease are largely unclear, and the prognosis of patients is very poor with only a 30 percent 5-year survival rate. Previously, our lab found that endothelial-specific Dicer1 knockout drives the development of AS in mice. Dicer1 is vital in microRNA (miRNA) biogenesis, therefore our finding indicates that miRNAs play a role in the development of AS. Previous work has identified microRNA-497-5p (miR-497) to have a tumor-suppressive role in AS and our lab confirmed that miR-497 suppresses cell viability more significantly than several other tested miRNAs. VAT1 has been validated by our lab as a direct target of miR-497 and is upregulated in AS tumors. VAT1 is also upregulated and promotes cell migration in glioblastoma, while also shown as a mitofusion-binding protein, meaning VAT1 directs mitochondrial fusion. Given these previous findings, we aim to investigate the function of VAT1 in AS cell migration and mitochondrial fusion. To do this, we have generated an AS cell line with CRISPR-Cas9 mediated deletion of VAT1. We will determine the consequence of this deletion on cell viability, migration, clonogenic colony formation, and mitochondrial fusion. The completion of this work will further define the potential tumor-promoting functions of VAT1 in AS.

Mentor(s):

Jason Hanna (Science); Annaleigh Powell (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 334
Presentation Time: Session 2: 11:30am-1pm

Study of the Effect of Microstructure on Thermal Conductivity of Squeezed Thermal Interface Materials

Author(s):

Wyatt Gay† (Engineering); Hannah Gagelin* (Engineering); Aidan Crowley* (Engineering); Alina Stuleanu* (Engineering)

Abstract:

No single scientific advancement in the last millennia can compare to the universal impact of the computer and the integrated circuit. Now in an effort to amplify the capabilities of this once-futuristic machine, industry specialists, university researchers, and defense programs partner together to propel forward hardware efficiency to push the boundaries of computational science. The critical nature of effectively managing the thermal output of components, specifically of microelectronics, to the aforementioned aspirations cannot be understated. Thermal interfacing materials (TIMs) were developed as a means of minimizing thermal resistance through the use of highly conductive filler particles. This study was conducted with the intent of understanding the influence of particle distribution during the squeezing and dispensing process on the efficiency of the TIMs as a conducting agent. Polymer-based TIMs are utilized to test various procedural alterations that can be made during dispensing and curing, specifically compression rate and bond line thickness (BLT). The effects of these variations are measured with 3D x-ray micro-computed tomography (XRCT) imaging, which is used to associate particle distribution and thermal conductivity. BLT is predicted to increase with squeeze rate and conductivity is expected to be higher at slower squeeze rates as particles spread farther to occupy a larger footprint. This study will indicate whether the described models are computationally sound and will provide an optimized process for the development of TIMs with maximized thermal conduction capabilities.

Mentor(s):

Amy Marconnet (Engineering); Ritwik Kulkarni (Engineering); Pranay Nagrani (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 335
Presentation Time: Session 2: 11:30am-1pm

To Innovate or Integrate: A Story of Mergers and Acquisitions in the Video Game Industry

Author(s):

Charlie Geis† (Management, Honors); Dustin Rabin† (Management, Honors)

Abstract:

Mergers and acquisitions (M&A) in the video game industry have become increasingly common over the last decade. The surge in popularity of live service games has led to increased M&A by larger firms. This is mainly to increase the amount of resources available to dedicate to large scale projects. Mergers and acquisitions are also more common because the value of IP and brand name has become far more powerful in recent years. Our consumer data and insights came from a survey of 100 plus respondents from various video game communities. We then used R-studio to analyze the consumer and financial data we compiled. Our findings from our survey and analysis have shown that gamers are increasingly playing fewer games and those games tend to follow the live service model as opposed to more traditional one-off releases. This corresponds with a decrease in games that follow the traditional multi-year release cycle with concentrated revenues at release with limited growth throughout the games life. With these demanding resource requirements to keep up with consumer and financial expectations, mergers and acquisitions have become far more prevalent in the video game industry and will continue to increase in the foreseeable future.

Mentor(s):

Wan Ting Chiu (Management)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 336
Presentation Time: Session 2: 11:30am-1pm

One for the many?

Author(s):

Hunter Gregory† (Agriculture)

Abstract:

Is the brutality of animals suffering worth it? Mice and Men explains new technologies being produced to hopefully lessen the testing done on animals in order to spare their lives. It also adds that we may not be able to fully rid ourselves of animal testing because of their unique immune systems. In fact, there is even a new breed of mice that have developed very “humanlike” immune systems that are being put to use currently. Do animals, even the smallest of them, deserve such harsh treatment?

We tend to run into an ongoing issue with government regulations and laws however that force drugs to be tested on animals before even reaching the human market for consumption or medical usage. This paper states that a company named “Biochip Collaborative” is working on changing this through their use of quorum sensing (how bacteria talks) by disrupting their communication and their formulation of more bacteria. This would make testing much cheaper and more ethical to proceed with. Their goal is to hopefully cut down and, in the future, see much more ethical ways of procuring safe medically approved vaccines/drugs for human usage.

Mentor(s):

Fiona Wang (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 337
Presentation Time: Session 2: 11:30am-1pm

Comparison of tRNA Regions in NedWong and C1 Cluster Phages

Author(s):

Elizabeth Grivetti† (Engineering); Allison Garrard† (Engineering); Molly Dye† (Engineering); Samuel Nasternak† (Agriculture, Engineering); William Townsend† (Agriculture, Engineering); Priya Veluri† (HHS); Jacob Paris† (Engineering); Courtney Usher† (Engineering); Meera Pala† (HHS); Aaron Haynos† (Engineering); Jacob Wilder† (Engineering)

Abstract:

Bacteriophages, also called phages, are viruses that attach to and infect bacteria. Due to their specificity, phages have many applications in therapeutic treatments, including precise delivery of medicinal macromolecules and gene therapy. Within all biological systems, tRNA molecules are responsible for transporting amino acids to the site of protein synthesis, thus allowing better utilization of host translation mechanisms. Studies show that phages with excess tRNA, specific to the phage and not found within the host, are capable of infecting hosts more efficiently. NedWong is a specific phage and a member of the C1 cluster, a genomic classification known to have genomes with large tRNA base pair regions. Our analysis quantified the tRNA present in phage NedWong and compared this to other C1 cluster members. The comparison covered the 91325-98312 base pair region in NedWong and other phages within the cluster since this region contains an overwhelming majority of the genome's tRNA. Phamerator, a phage genome mapping program, was used to compare the location and the surrounding genes between phages. Aragorn (v1.1), Aragorn (v1.2), and tRNAscan-SE were used to further analyze the quantity of tRNA. The size and location of tRNA regions within NedWong have been shown to mirror the tRNA regions within numerous other C1 phages. Since infection efficiency is a prominent tRNA function in phages, future research on C1 cluster tRNA regions should investigate their infection strategies and specific subtypes of tRNA.

Mentor(s):

Kari Clase (Agriculture); Harry Ashbaugh (Engineering); Daphne Fauber (Engineering); Aaron Gin (Engineering); Adam Quinn (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 338
Presentation Time: Session 2: 11:30am-1pm

Triboelectric Nanogenerators for Disease Detection: Heart Rate and Pulse Monitoring

Author(s):

Meghan Gron† (Engineering, Honors); Blake Iftiger* (Engineering); Conor McCarthy* (Engineering); Saichandana Pothireddy* (Engineering, Honors); Justin Lesinski* (Engineering); Hongyi Shen* (Engineering)

Abstract:

Heart disease is the leading cause of death both in the U.S. and worldwide [1]; one person dies every 34 seconds in the United States from cardiovascular disease [2]. One way to monitor risk for cardiovascular disease is to regularly monitor heart rate. Research has found that a resting heart rate near the top of the 60 to 100 range can increase your risk for cardiovascular disease and even early death [3]. However, current heart rate monitoring techniques, such as photoplethysmography and electrocardiography, are inconvenient for daily wearing and continuous biomonitoring. Portable electrocardiograms, such as the Holter Monitor, can be uncomfortable and cause tissue breakdown or skin irritation at the application site [4]. Furthermore, neither photoplethysmography or electrocardiography devices are self powered, implying they need to charge and cannot truly be worn continuously [5]. An alternative method for convenient, continuous heart rate monitoring is seen in triboelectric nanogenerators. Triboelectric nanogenerators (TENG) can power wearable sensors through triboelectrification. Triboelectrification occurs when two dielectric materials, such as skin and a dielectric layer, come in contact with one another and create electricity via friction [6]. TENG devices can measure arterial pulse waves and pressure changes through the deformation of skin associated with pulse when worn on the wrist. The pulse waveform obtained by the TENG device can be used to continuously measure heart rate [7]. Wearable TENGs for heart rate monitoring are a more convenient method of continuous pulse monitoring for indication of cardiovascular diseases.

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Mentor(s):

Wenzhuo Wu (Engineering); Nachiket Vatkar (Engineering)

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Poster Presentation Abstract Number: 339
Presentation Time: Session 2: 11:30am-1pm

A dynamic spatio-temporal statistical model for large satellite climate data sets

Author(s):

Jerry Gu† (Science)

Abstract:

Satellite remote sensing is an efficient and economical tool for observing air quality across expansive regions. This data can be employed to pinpoint the sources of air pollution, detect changes in air quality over time, and assess pollution levels in different locations. In the long run, it can be used to evaluate the effects of air pollution on human health, the environment, and climate. However, due to the coarse spatial and temporal resolutions of satellite data, it can be difficult to identify the source and location of the pollution and make decisions about how to address the issue. To tackle this challenge, it is essential to construct statistical models that can capture the dynamic spatial and temporal distribution of the data. This study used the Bayesian approach to analyze a massive satellite data set to estimate the spatio-temporal distribution of ozone pollution. The model is unique in its dynamic nature, as it accounts for how a spatial process changes over time. The data used in this paper came from the Ozone Monitoring Instrument (OMI) aboard the NASA's Earth Observing System (EOS) Aura satellite, which measures the level and distribution of ozone in the atmosphere, as well as other trace gases and aerosols. The model was used to create a spatio-temporal map of ozone concentration in the USA. We further discussed the patterns and trends, as well as the social-economic factors contributing to the patterns.

Mentor(s):

Guang Lin (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 340
Presentation Time: Session 2: 11:30am-1pm

Advancing the Accessibility of the Fort Ouiatenon Archaeological Collection

Author(s):

Jarren Haggard† (Liberal Arts); Mikayla Klemp† (Liberal Arts)

Abstract:

Jarren Haggard, Mikayla Klemp, Dr. Kory Cooper, Kelly Lippie, Purdue University, West Lafayette

Fort Ouiatenon is an eighteenth-century fur trading fort that was occupied by French and Indigenous traders along the Wabash River. Excavations of the original fort site have taken place since 1968 under Indiana University, through the 1970s with Michigan State University, and by various universities in the twenty-first century. Most of the materials and artifacts from these excavations are now housed at the Tippecanoe County Historical Association, who oversees the care and administration of the Fort Ouiatenon site and assisted the WILKE students in facilitation of this research project. This project (Fall 2022 and Spring 2023 semesters) builds on earlier work by Purdue CLA Wilke interns and focuses on the digitizing and organizing of the early excavation records and artifacts from the twentieth century archaeological investigations. During the digitizing process, WILKE students have had the opportunity to learn about various archaeological processes and the history of the Fort. Highlights of this collections care process and the accompanying Fort Ouiatenon archaeological history will be the focal point of the Spring Research Expo presentation. The end goal of this project is to make these kinds of research opportunities on the undervalued Ouiatenon collection more accessible by digitizing documents, maps, notes, and photographs, as well as rehousing artifacts to keep them better preserved. Furthermore, these resources may be used by universities or even secondary education institutions to educate students on the process of an archaeological excavation for those interested in pursuing a major or career in this field.

Mentor(s):

Kory Cooper (Liberal Arts); Kelly Lippie (Tippecanoe County Historical Association)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 341
Presentation Time: Session 2: 11:30am-1pm

Exploring Neurite Complexity in Cortical Neurons Carrying an Epilepsy-Linked SCN2A Mutation: A Human-Induced Pluripotent Stem Cell Study

Author(s):

Hope Harlow† (Pharmacy); Muhan Wang* (Pharmacy); Conrad Otterbacher* (Science)

Abstract:

Epilepsy is a neurological disorder that causes the misfiring of neurons, leading to random, unprovoked seizure episodes. We study the SCN2A gene in the lab, which encodes sodium channel Nav1.2. Mutations in this gene are known to cause severe seizures in infancy/younger adolescence. An example of such mutation is the L1342P variant. There are only 6 known cases of epilepsy with the L1342P mutation worldwide, so little information is known about how the mutation will affect neuronal development. Therefore, to study it, our lab uses human induced pluripotent stem cells (hiPSCs) that have been CRISPR edited to include the L1342P mutation to derive cortical neurons suitable and accessible for experiments.

This project aimed to study possible changes in neuron morphology associated with the presence of the L1342P mutation. We hypothesize that the mutation would cause changes to the neurite complexity and shape. We have quantified structural characteristics such as: soma size, neurite length, number, and branching complexity using a state-of-the-art software called Neurolucida360. Our results will provide insight on how the L1342P mutation affects neuronal development.

Mentor(s):

Yang Yang (Pharmacy); Maria Olivero-Acosta (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 342
Presentation Time: Session 2: 11:30am-1pm

TMAP: an alternative approach to transmetatarsal prosthesis

Author(s):

Simon Hasik† (Engineering); Moses Hamm† (Engineering, Honors); Mikko Chapman† (Engineering); Aaron Coppeta† (Engineering)

Abstract:

Transmetatarsal amputation is a procedure common in diabetic patients which removes the front half of the foot, starting at the middle of the metatarsal bones. Despite being one of the most common amputations for patients with diabetes, there are only two types of prosthetics currently available. The first is a rigid plate, while the other is a piece of rubber which aesthetically resembles the foot but provides little support. Both options severely disrupt gait biomechanics, causing pain to propagate to the knees, hips, and spine. The goal of the transmetatarsal amputation prosthetic (TMAP) project is to provide a flexible and supportive prosthetic which minimizes gait disruptions. Physiological loading conditions from the literature determined the performance needs for TMAP, and the design was optimized for repeated bending loads. This was accomplished through the use of a flexible base plate, support blocks along the length of the plate, and multiple springs which bring the device back to its initial condition following bending deformation. Finally, the device is fixed to the remainder of the limb using a modified ankle brace. A prototype has been built which will be subjected to various in vitro tests in order to assess its bending strength, fatigue properties, and ability to remain attached to the foot. Through the use of special types of 3d printed materials TMAP is able to offer an individualized design that is able to present a lightweight, cost-effective prosthetic which may help an underserved population regain mobility following transmetatarsal amputation.

Mentor(s):

Neal Patel (Engineering)

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Poster Presentation Abstract Number: 343
Presentation Time: Session 2: 11:30am-1pm

In early childhood are maternal depressive symptoms associated with child social communication concerns?

Author(s):

Gabriella Hays† (HHS)

Abstract:

Children with mothers who struggle with depression are at an increased risk for social communication difficulties. Studies report depressed mothers appear to engage less socially with their children, which can impact language, social, and communication development. The present study expands our understanding of social communication skills in early childhood by examining maternal self-reports of depressive symptoms. Based on previous research, we expected mothers who endorse more depressive symptoms to have children with greater social communication concerns.

This secondary data analysis study included 35 mothers raising children with social communication concerns. Maternal depression was measured using the Center for Epidemiological Studies-Depression Scale (CES-D) and the Vineland Behavior Scales (VABS) was used to assess social communication skills in their children.

The mean CES-D total score was 12.6 (SD = 6.37), with scores ranging from 6 to 30. A total of 7 mothers (20%) reported elevated depressive symptoms. The mean VABS score was 11.51 (SD = 2.84), with scores ranging from 4 to 19. A Pearson Correlation was run on the relationship between maternal CES-D scores and child VABS scores. There was no significant correlation between the two, $r(35) = -.03$, $p = .42$. A regression model with the addition of two sociodemographic covariates (marital/partner status and family income) resulted a similar non-significant result, $F(2,31) = 1.11$, $p =.34$. In sum, there is no evidence of a robust association between maternal depressive symptoms and child social communication difficulties within this sample of children with established social communication concerns.

Mentor(s):

AJ Schwichtenberg (HHS); Amy Janis (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 344
Presentation Time: Session 2: 11:30am-1pm

A Feynman-Kac Type Theorem for ODEs: Solutions Of Second Order ODEs as Modes of Diffusions

Author(s):

Hudson Hochstedler† (Engineering)

Abstract:

In this paper, we prove that the “most likely” path of a particular diffusion, as defined by the Onsager-Machlup function, solves a broad class of second order ordinary differential equations. Solving differential equations has long been a topic of interest in applied mathematics for its use in modeling a wide variety of physical phenomena, however, closed form solutions to these systems often do not exist and instead require numerical approximation. We take inspiration from the Feynman-Kac theorem which says the solution to a broad class of second order parabolic equations is the mean, rather than the mode, of a diffusion. Our result allows us to solve high-dimensional systems of ODEs more efficiently than conventional numerical integration techniques. We end by comparing a functional gradient descent implementation of our result to common numerical solvers.

Mentor(s):

Harsha Honnappa (Engineering); Zachary Selk (Queens University)

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Poster Presentation Abstract Number: 345
Presentation Time: Session 2: 11:30am-1pm

SoCET Pre-Silicon Verification on Timer using Universal Verification Methodology

Author(s):

Fan Jing Hoon† (Engineering)

Abstract:

Modern System-on-Chip (SoC) consists of many peripherals that provide different chip functionality. The System-on-Chip Extension Technologies (SoCET) team has developed new designs for the upcoming AFTx07 chip including a new timer design. The timer times a number of clock cycles, captures and compares signals, enables interrupts, and generates time-controlled signal output. Before sending the SoC design for manufacturing, verification of the functional blocks should be done to lower the risks of hardware bugs being captured in the chip. Thus, this research project’s main goal is to fully verify the timer block using Universal Verification Methodology (UVM). UVM is the industry standard for digital design due to its reusability, flexibility, and object-oriented programming capability. The timer testbench will need to write to the timer registers and accommodate the interrupt signals. By fully verifying the timer block, the team can design the next high-quality chip.

Mentor(s):

Mark Johnson (Engineering); Sarang Pramod (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 346

Presentation Time: Session 2: 11:30am-1pm

Does Sex Mediate Elimination and Toxicity in the Amphibian Model Xenopus laevis

Author(s):

Sophia Horn† (Science)

Abstract:

Per- and polyfluorinated alkyl substances are ubiquitous environmental toxins, but risk of exposure to humans and wildlife are not well characterized. Despite that sex has been found to be an important determinant of elimination rates in some species, whether this is true in amphibians is unknown. The purpose of this project was 1) to genetically determine the sex of larval Xenopus laevis involved in a perfluorooctanoic acid (PFOA) toxicokinetic reference value study and 2) to evaluate the covariability of sex and PFOA exposure regarding depuration and larval growth and development. X. laevis larvae (n=576) underwent aquatic exposure based on a standardized amphibian metamorphosis assay protocol. Sex was determined by amplifying two genes linked to X. laevis sex chromosomes: the DMRT1 gene expressed in both ZW (female) and ZZ (male) gonads, and a sex-determining W-linked DM-domain gene DM-W expressed only in females. Conventional polymerase chain reactions amplified the target genes, and resulting gene bands were visualized using gel electrophoresis to identify DMRT1 and the sex-indicating DM-W gene whose exclusive presence in females thereby determined sample sex. Interactions between sex and PFOA toxicokinetics will be determined using mixed model ANOVAs. We hypothesize that there will be a difference in depuration rate between sexes, with males expected to metabolize PFOA at a slower rate compared to females. Our results have implications for human and environmental health as it should not be assumed males and females interact with contaminants in the same way.

Mentor(s):

Maria Sepulveda (Agriculture); Tyler Hoskins (Agriculture); Meredith Scherer (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 347
Presentation Time: Session 2: 11:30am-1pm

Towards Improved Global Food Security—Uncovering How Tomatoes Fight Root-Knot Nematodes

Author(s):

Chingyan Huang† (Science)

Abstract:

The nematode genus, Meloidogyne, known as root-knot nematodes, are highly damaging plant parasites that infect a plant's roots and hinder its ability to gather nutrients. It has been reported that these nematodes may cost the world as much as $100 billion in crop damages. Traditionally, nematodes are controlled using pesticides, but the low efficiency and negative environmental impacts of chemical treatments call for the development of other Meloidogyne management techniques. In this study, we specifically examine the resistance response of tomato (Solanum lycopersicum) infected by Meloidogyne, because tomato is one of the world's most economically significant crops with gross production earnings of $88 billion . Moreover, multiple studies have reported genes that might confer resistance to Meloidogyne infection in different tomato plant cultivars. However, genetic pathways for nematode resistance in tomatoes warrant further study due to the complex genetic backgrounds of different tomato cultivars. To examine nematode-resistance pathways, we curated transcriptomic profiling data collected using next-generation sequencing from tomatoes infected with Meloidogyne. Curated reads from multiple studies will be pooled and aligned to the tomato genome to estimate gene expression, which will identify common tomato genes that are significantly up- or down-regulated in response to nematode infections. Resistance pathways will be explored using a mutual-rank co-expression analysis, which will detect gene clusters with similar expression patterns post-nematode infection. The findings from this study could reveal important stress response mechanisms in tomatoes, which could lead to the improvement of Meloidogyne crop resistance and begin to address issues with global food security.

Mentor(s):

Chao Cai (Libraries)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 348
Presentation Time: Session 2: 11:30am-1pm

Youth Driving Restriction Laws

Author(s):

Quinlan Huntzinger† (Liberal Arts); Daniella Ferrante* (HHS)

Abstract:

The purpose of this study was to understand the nature and effects of state laws which revoke or restrict juvenile drivers' licenses as a result of school discipline or attendance issues. For many teens, getting their driver's license is an important step towards becoming independent, or even an economic necessity to support themselves or their families through employment. So it is important to know how these policies may be affecting juveniles. Previous work has demonstrated laws affecting juvenile drivers' licenses as a result of school discipline/attendance have become fairly common across the United States. However, no former studies have determined what predicts states adopting these laws or how many young people they affect. This study used Google searches to identify 25 states with laws affecting juvenile drivers' licenses as a result of school discipline/attendance. In addition, data from the Federal Highway Administration's Highway Statistics on driver's license holders across age groups from 1980-2020 were compiled. These databases will be analyzed to determine how these laws have impacted juveniles' drivers' licenses.

Mentor(s):

Spencer Headworth (Liberal Arts); David McElhattan (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 349
Presentation Time: Session 2: 11:30am-1pm

Expression of Copper Chaperone for Superoxide Dismutase (CCS) in the Blood-CSF Barrier and Impact of in vivo Lead Exposure in Mice.

Author(s):

Vivian Hurn† (HHS, Liberal Arts, Honors)

Abstract:

Copper chaperone for superoxide dismutase (CCS) is a copper chaperone protein with antioxidative functions. CCS has been found to be expressed in the choroid plexus, a brain tissue that constitutes a barrier between the blood and cerebrospinal fluid (CSF) in brain ventricles and is known to play a vital role in maintaining copper homeostasis. This study tests if Pb accumulation in choroid plexus following chronic exposure interferes with CCS expression in the choroid plexus which may contribute to altered Cu brain homeostasis. Mice received oral gavage at doses of Pb acetate at 13.5 mg Pb/kg, once daily for 28 days. Atomic absorption spectroscopy (AAS) analysis revealed blood lead levels (BLLs) were 0.1 ± 0.2 (SD) µg/dL and 35.0 ± 8.0 µg/dL in control and Pb-exposed animals. Immunohistochemistry was utilized to visualize exposure of CCS expression in brain tissues via confocal microscopic imaging. The data showed that Pb groups had significantly increased CCS expression in the choroidal epithelial cells by 92.9%, but with no changes in the choroidal endothelial cells. CCS was found to express abundantly in the subventricular zone (SVZ) as well. Pb exposure appeared to increase CCS expression in SVZ by 20.2%, although this increase did not meet statistical significance. Exposure to environmental Pb causes an increased expression of CCS specifically in the epithelial cells, suggesting an activated defense against Pb toxicity and possible interference with Cu regulation. Further research to explore the mechanisms whereby Pb altered the CCS with resulting Cu dyshomeostasis in the CSF is in progress.

Mentor(s):

Wei Zheng (HHS); Luqing Liu (HHS); Tianyuan Sang (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 350
Presentation Time: Session 2: 11:30am-1pm

Studying stress levels using triboelectric nanogenerators

Author(s):

Blake Iftiger† (Engineering); Conor McCarthy‡ (Engineering); Saichandana Pothireddy‡ (Engineering); Hongyi Shen‡ (Engineering); Justin Lesinski‡ (Engineering); Jacob Zendejas‡ (Engineering); Meghan Gron* (Engineering, Honors)

Abstract:

Stress is a commonly felt emotion that occurs due to a variety of complex factors in life. Generally, stress is a feeling of threatened homeostasis [1], causing a stimuli response. Studying stress can provide insight into a person’s mental and physical health. Stress can be measured either qualitatively using subjective assessments and secondary task assignments, or quantitatively through physiological response measurements [2]. Subjective assessments operate by presenting subjects with questionnaires that evaluate mental workload while secondary task assignments use the difficulty of multi-tasking to observe the effect of stress on the body. Physiological measures rely on measuring the body’s response to external stimuli, creating an accurate measure of the physiological effects of stress [2]. Specifically, heart rate variability and heart rate (HR/HRV) are two important physiological measures for reading stress levels, as they are directly impacted by the onset of stress [3]. When a stress response is induced, sensors can be used to study the variation in the physiological data collected in a non-invasive manner. This can be accomplished by incorporating tests to induce a high mental workload in subjects, such as dual-task paradigms. Triboelectric nanogenerators (TENG) work to provide a sustainable energy source through friction, which can be applied to wearable devices to make them self-powered [4]. Current electrocardiograms can be placed directly on the skin, allowing room for the incorporation of a TENG. Through applying the TENG schematic to a wearable ECG, a self-powered and sustainable sensor for monitoring stress levels can be created.

Mentor(s):

Wenzhuo Wu (Engineering); Nachiket Vatkar (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 351
Presentation Time: Session 2: 11:30am-1pm

The Effect of Cinnamon and D-Limonene Nanoemulsions on the Growth of *Arabidopsis thaliana* under Abiotic Stress Conditions

Author(s):

Lucas Johnson† (Engineering)

Abstract:

Abiotic stress factors such as salinity, drought, and extreme heat negatively impact agricultural yield and threaten global food security. The encapsulation of bioactive materials in nanomaterials has been extensively studied in the pharmaceutical industry for improving bioavailability, reducing active ingredient dosage, and increasing efficacy. The agricultural sector stands to benefit from nanotechnology applications for similar reasons, such as enhanced bioavailability, reduced active ingredient dose, and increased efficacy. Historically, essential oils have been known for their antimicrobial properties; however, their usage has been limited by poor solubility and rapid degradation. In previous work, nanoemulsions have encapsulated essential oils (D - Limonene and Cinnamon) in a stable, biocompatible system. Furthermore, D-Limonene and Cinnamon nanoemulsions applied to the roots were shown to induce a physiological defensive response in *Arabidopsis thaliana*. This study hypothesized that D-Limonene and Cinnamon nanoemulsions could enhance plant survivability under abiotic conditions by inducing the same physiological defense response prior to the stress condition. *Arabidopsis thaliana* plants were exposed to 60 hours of abiotic stress (100 mM NaCl, 150 mM NaCl, 45 ℃, or water deprivation) and followed by 60 hours of recovery in a hydroponic solution. The results show that D-Limonene nanoemulsion treatments during the recovery phase of 100 mM NaCl significantly increased plant survivability compared to untreated plants. The study provides valuable insights into the potential use of essential oil nanoemulsions to address the harmful effects of abiotic stress on plant survivability.

Mentor(s):

Kurt Ristroph (Agriculture); Luiza Olivera (Engineering); Pablo Vega (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 352
Presentation Time: Session 2: 11:30am-1pm

Development of a Tilt-Rotor VTOL Aircraft for a Payload Drop Mission

Author(s):

Jason Jong† (Polytechnic Institute); Niall Moloney† (Engineering); Joey Pelletier† (Engineering); Ian Laudo† (Engineering); Jack Schwyn† (Management); Daksh Negi† (Engineering); Kevin Clapp† (Engineering); Shri Eda† (Engineering); Austin Lee† (Engineering); Dylan McCool† (Engineering)

Abstract:

Advances in hobbyist-level aircraft electronics and software have enabled an explosion of possible configurations of aircraft to achieve a greater diversity of missions beyond exclusively a point-to-point flight. One such mission profile is a mission involving a payload drop. This mission possesses its own unique challenges such as the additional weight a payload provides as well as the complexity of accurately dropping the payload considering environmental factors and a nonzero payload initial velocity due to the airplane speed. Additionally, takeoff and landing continue to be mission segments which are difficult to accomplish reliably. Failure to succeed in either of these segments will result in damage to the airplane and a potential aborted flight. Some of the previously mentioned alternate configurations have been developed with the intent to address these common issues, among them being a Vertical TakeOff and Landing (VTOL) aircraft. To better optimize an aircraft to complete a payload drop mission over a long-range, we are building a tilt-rotor VTOL aircraft capable of in-flight transition into and out of a hover configuration. Our intent is to show that a tilt-rotor aircraft will be more reliable on takeoff and landing and achieve a more accurate payload drop, all while maintaining near the cruise efficiency that traditional fixed-wing airplanes offer. Successfully demonstrating this will be beneficial in further integrating VTOL and/or tilt-rotor technology into more advanced aircraft to enhance performance and reduce required maintenance due to damage incurred on takeoff and landing.

Mentor(s):

Brandon Dimitri (Engineering); Brandon Dimitri (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 353
Presentation Time: Session 2: 11:30am-1pm

Microstructure evolution of concentrated surfactant solutions with varying desiccant, plasticizer, and crystallizer additives

Author(s):

Matthew Kaboolian† (Engineering)

Abstract:

Reducing excess water in surfactant solutions can combat the increasing scarcity of water. The goal of this study was to characterize how the microstructure and rheological properties of concentrated surfactant solutions change with decreased water content and addition of common additives. The microstructure of concentrated 70 wt.% sodium laureth sulfate (SLES) surfactant in water was characterized by small angle x-ray scattering (SAXS) and birefringence through a crossed-polarized optical shear cell. The addition of a model desiccant (sodium chloride, NaCl), plasticizer (propylene glycol, PG), and crystallizer (cetyl stearyl alcohols, CS) changed the microstructure of the fluid. One dimensional SAXS profiles indicated multiple phase transitions between flat lamellae sheets, micelles, and hexagonal phases with the addition of different additive concentrations. Pure 70 wt.% SLES was composed of lamellar sheets while a transition from lamellae to hexagonal phase occurred at NaCl concentrations of 1-2 wt.% and PG concentrations of 10-20 wt.%. Phase characterization was supported by birefringent shear results of the 70 wt.% SLES showing shear thinning and weak birefringence - indicative of lamellar sheet phases. Samples containing high concentrations of NaCl, or PG did not flow under gravity and were strongly birefringent - indicative of a hexagonal phase. The correlation between changes in bulk phase structure, measured viscosity, and birefringence demonstrates that when combined SAXS and cross-polarized optical shear are powerful methods to explore the structure-processing relationships of concentrated surfactant fluids.

Mentor(s):

Kendra Erk (Engineering); Parth Kelkar (Engineering); Seth Lindberg (Procter & Gamble)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 354
Presentation Time: Session 2: 11:30am-1pm

Determining the contribution of CHD ATP-dependent remodelers to chromatin assembly in Arabidopsis

Author(s):

Joshua Kaluf† (Agriculture)

Abstract:

Abstract Redacted.

Mentor(s):

Joe Ogas (Agriculture); Jiaxin Long (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 355
Presentation Time: Session 2: 11:30am-1pm

Population study of the explosion properties and host galaxy environments of supernovae from the Zwicky Transient Facility

Author(s):

Grace Katz† (Science); Roy Galazka† (Science); Zheng Yuan Tan† (Science); Haoyu Shen† (Science); Braden Garretson‡ (Science); Ethan Pinarski‡ (Science)

Abstract:

With the launch of modern all sky surveys such as the Zwicky Transient Facility (ZTF) and the anticipation of the upcoming Legacy Survey of Space and Time (LSST), focus turns to finding new and more efficient ways to filter and classify data. Since most of the supernovae observed by ZTF do not have spectroscopic information available, it is important to be able to use photometric classifications to fully make use of the power of these new facilities. We use MOSFIT, an open source tool for astronomy that is capable of inferring explosion properties from light curves based on physical parameters, to perform a population study of the explosion properties of supernovae and their host galaxy environments using photometrically classified supernovae from ZTF. Our analysis can lead to better understanding of the influence of host galaxy environments on the explosion parameters of supernovae, thereby increasing the ability of scientists to predetermine when and where types of supernovae will occur, allowing for more precise and complete observations.

Mentor(s):

Dan Milisavljevic (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 356
Presentation Time: Session 2: 11:30am-1pm

Mindfulness induction and executive function after high-intensity interval training with and without mindful recovery intervals

Author(s):

Rida Khatri† (HHS, Honors)

Abstract:

High intensity interval training (HIIT) is a form of activity consisting of multiple short exercise bouts interspersed by recovery intervals. Recent evidence shows acute benefits of HIIT on subsequent cognitive performance requiring executive function (EF). Similar enhancements have been observed following acute engagement in mindfulness, a psychological state characterized by heightened awareness and attention with minimum evaluative and judgmental thought processes. By incorporating mindfulness activities into the recovery intervals of HIIT, this study investigated the efficacy of an innovative Mindful HIIT protocol versus traditional HIIT without mindfulness in inducing mindfulness state and enhancing EF performance. Forty adults completed the Mindful HIIT and HIIT-only conditions on separate and counterbalanced days. Before and after each condition, participants performed three tasks to assess inhibitory control, cognitive flexibility, and working memory components of EF. The results showed greater mindfulness induction following the Mindful HIIT compared to the HIIT-only condition and a positive correlation between dispositional mindfulness with the degree of mindfulness induction selectively for the Mindful HIIT condition. Response accuracy during the switch-flanker task improved from the pretest to posttest for the HIIT-only condition but remained unchanged for the Mindful HIIT condition. No between-condition difference in other EF outcomes was found. These findings suggest that incorporating mindfulness activities during the recovery intervals of HIIT is effective for inducing state-related mindfulness. However, such mindfulness induction may attenuate HIIT-related benefits to cognitive flexibility and may not contribute to additional benefits to inhibitory control and working memory.

Mentor(s):

Alvin Kao (HHS); Nicholas Baumgartner (HHS); Kyoungmin Noh (HHS)

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Poster Presentation Abstract Number: 357
Presentation Time: Session 2: 11:30am-1pm

Indianapolis Green Spaces and Parks Expansion

Author(s):

Kayla Kramer† (Agriculture)

Abstract:

This project aims to develop a toolkit for sustainable, environmentally conscious development and a community master plan that showcases its possible applications in Southeastern Indianapolis, along Buck Creek. Most of the land currently is farmland or otherwise undeveloped, and the city has plans to create many subdivisions in the future. Buck Creek is a large greenway that supports local habitats and currently has very little programming. Communities need accessible, high-quality green spaces that not only allow for public enjoyment, relaxation, and recreation, but that also exemplify stewardship for the land. If development is going to happen, it has to be done responsibly for the good of all life. What makes a piece of land suitable for development, and what are the most effective green infrastructure elements that could be implemented in suburban areas? The data used in this study includes tree cover, flood information, existing waterways, and proximity to existing developments. GIS was used to gather the data and overlay the information to choose a suitable site in the study area. Flooding possibility and tree cover were two most influential factors taken into consideration. From these models, elements such as proximity to water sources and percentage tree cover informed the implementation of several green infrastructure elements. While this varies by site, the toolkit will address these varying results and be a reference for factors indicating suitable development and accompanying practices. These results enabled the creation of an example master planned community as a framework model for future developments.

Mentor(s):

Aaron Thompson (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 358
Presentation Time: Session 2: 11:30am-1pm

DeepFake Detection

Author(s):

Erin Joy Kramer† (Science); Maheep Brar† (Science)

Abstract:

DeepFakes are a dangerous technology involving various types of realistic video editing that can and has been utilized in forms of blackmail and defamation. Specifically, one major use case are face swaps, where one person's face is overlaid on another face in the original video. Methods like these allow for the spread of misinformation and damaging content, and are only becoming more accurate with time. DeepFakes are created by training an autoencoder architecture on two sets of faces, learning a set of latent features that represent the face, and then using the decoder for the second face on the latent features of the first. In this project, we are developing a method for detecting DeepFakes, specifically trained on face swaps. To do so, we exploit the fact that videos manipulated by machine learning algorithms with the intentions of face swapping often have various visual inconsistencies between frames. Our planned detection method will use a pre-trained Fast Region-based Convolutional Neural Network to extract the parts of the images containing people, and then pass those sections into a recurrent detection network, which utilizes a Convolutional Neural Network feature extractor and a Long Short-Term Memory network for temporal analysis that is trained end-to-end for DeepFake classification. This method will allow us to learn features from each frame of the image and compare them over time to catch visual inconsistencies, while localizing these learned features to the relevant parts of the image. To train this network, we use the open source DeepFake Detection Challenge dataset.

Mentor(s):

Edward Delp (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 359
Presentation Time: Session 2: 11:30am-1pm

Subjective Health, Disease Burden, and Risk of Mortality: Role of Medication Use.

Author(s):

Alexis Lautenschlaeger† (Science)

Abstract:

Chronic conditions become more common with age, and risk of mortality increases accordingly. However, subjective perception of health plays a role in risk of mortality regardless of disease burden. We recently found that SRH moderated the association of chronic disease burden and mortality: mortality risk did not increase with higher disease burden when SRH was excellent. In this study we hypothesized that taking medications for chronic conditions might affect participants' perceived health, and that medication use would predict greater mortality. Data were from the second wave of the Midlife in the US (MIDUS study, N=5,524). Disease burden was measured as a sum of chronic conditions weighted by how disabling the conditions are. SRH was measured on a scale of 1-5 (1=poor, 5=excellent). Mortality data were collected through 2018. Use of medications for heart disease, diabetes, hypertension, and hyperlipidemia was self-reported. Results from a logistic regression model showed that taking medications for heart disease and diabetes, but not for hypertension and hyperlipidemia, significantly predicted mortality. Results from t-tests showed that medication use was associated with significantly worse SRH. Importantly, including medication use in the model significantly reduced the strength of the SRH x chronic disease burden interaction: participants who rated their health as poor had less of an increase in mortality with increased disease burden when medications were considered. Overall, this study suggests that the number of medications people take for chronic conditions influences their perceived health and may explain some of the well-established relationship between SRH and mortality.

Mentor(s):

Elliot Friedman (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 360
Presentation Time: Session 2: 11:30am-1pm

Assessing Career Development in a Microelectronics Workforce Program

Author(s):

Briana Lavine† (Engineering)

Abstract:

With growing demand for microelectronics, there is a need for a larger United States microelectronics workforce. SCALE (Scalable Asymmetric Lifecycle Engagement) is a microelectronics workforce development program focusing on supporting students in their career development through mentorship, targeted curriculum, and increased work experience. The purpose of this study is to examine differences in career development between SCALE students across race, gender, year in school and year in SCALE. The research questions are: 1) what differences in levels of career development exist in student academic cohorts and cohorts in the SCALE program; 2) what differences in levels of career development exist in students' racial and gender groups? We utilized Lent et al. (2013) Social Cognitive Career Theory instrument (SCCT) to assess seven factors that impact career development and persistence. The SCCT instrument was distributed to 430 SCALE students in the Spring of 2023, with 100 students completing the survey. After data cleaning, 84 were left for analysis. Descriptive statistics were calculated for each scale and student group. Overall, students who had been in the SCALE program longer had higher means on all scales. Across gender, women reported higher levels ach scale except for Self-Efficacy. Across racial groups, Black students within the program reported lower averages for each scale except for Self-Efficacy. One recommendation of this work is that SCALE should focus on providing more career supports for incoming students. Future research should include longitudinal analysis of career development for SCALE students throughout involvement in program.

Mentor(s):

Adrian Gentry (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 361
Presentation Time: Session 2: 11:30am-1pm

Material properties for screen printable inks for TENG devices

Author(s):

Justin Lesinski† (Engineering); Conor McCarthy‡ (Engineering); Meghan Gron‡ (Engineering, Honors); Jacob Zendejas‡ (Engineering); Hongyi Shen‡ (Engineering); Blake Iftiger‡ (Engineering); Saichandana Pothireddy‡ (Engineering, Honors)

Abstract:

Triboelectric-Nano Generator (TENG) devices are a method to create small amounts of energy from mechanical stimulation. This makes them an ideal energy source for wearable devices if stable manufacturing methods can be developed. Manufacturing techniques for TENG devices are being researched and one of the current leading technologies is screen printing. Screen printed TENG devices have been created using layered inks that suspend active materials. [1] Each layer is printed over the previous to form the TENG structure. For an ink to be effectively screen printed, its elastic and viscous moduli should be optimized. For viscoelastic ink, a high elastic modulus is necessary to properly screen print but too high moduli causes issues with spreading. High viscous moduli result in liquid inks that print poorly due to bleeding artifacts. [3] Different printing parameters can be adjusted to compensate for the ink material properties such as printing speed, squeegee pressure, snap off distance, and squeegee angle. [3] Understanding the material properties of inks is crucial for effective screen printing.

References:

Cao, R., Wang, J., Zhao, S. et al. Self-powered nanofiber-based screen-print triboelectric sensors for respiratory monitoring. Nano Res. 11, 3771–3779 (2018). https://doi.org/10.1007/s12274-017-1951-2

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Mentor(s):

Wenzhuo Wu (Engineering); Nachiket Vatkar (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 362
Presentation Time: Session 2: 11:30am-1pm

Design and Development of an Inert Controlled Environmental Chamber for VOC Characterization

Author(s):

Zachary Limaye† (Engineering); Brian Magnuson* (Engineering)

Abstract:

Household and personal care products are potent sources of aerosol pollutants. Fragranced products are classified as scented volatile chemical products (sVCPs). Common sVCPs that people use on a daily basis include deodorants, soaps, incense, candles, etc., and these carry pleasant scents like mint, lemon, lavender, vanilla, etc. These sVCPs are known to emit volatile organic compounds (VOCs), a wide variety of chemicals. Some of these VOCs are known to lead to adverse health effects, but the consequences on cognitive and emotional response is not thoroughly studied. This study aims to use a controlled environmental chamber to characterize VOC emission from sVCPs, while recording human response with odor assessment and biometric data.

This study designed and developed an inert controlled environmental chamber to isolate the sVCPs. The VOCs emitted are measured in real-time (1Hz) with a high-resolution proton transfer reaction time-of-flight mass spectrometer (PTR-TOF-MS). The PTR-TOF-MS records the chemical composition of the air as it is altered by the sVCP emissions. The chamber utilizes clean air from a zero-air-generator to ensure no external VOCs are measured. The clean air is supplied into the chamber with a constant air exchange rate, and airflow is directed to a sniffing port for human assessment. Additionally, the temperature and relative humidity will be measured in real time. At various intervals, the participants heartrate and blood-oxygen saturation are monitored concurrently with odor assessment. The integration of the chamber and PTR-TOF-MS will provide novel discoveries regarding the relationship between indoor air quality and human physiological behavior.

Mentor(s):

Nusrat Jung (Engineering); Brandon Boor (Engineering); Jordan Cross (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 363

Presentation Time: Session 2: 11:30am-1pm

Limiting distributions of Self-Interacting Random Walks

Author(s):

Xiaoyu Liu† (Science, Honors); Lei Fu† (Science)

Abstract:

Classical simple random walks are known to converge in distribution, after appropriate scaling of time and space, to a continuous process called Brownian motion. This project focuses on studying self-interacting random walks on the integer lattice, where the transition probabilities are determined by the ratio of weights of neighboring edges. The weight function is assumed to be monotonic and asymptotically polynomial. Our goal is to determine whether self-interacting random walks have a limiting distribution under proper scaling.

To achieve this, we use numerical simulations for self-interacting random walks with a given weight function, and perform hypothesis tests on various test statistics. We also develop an adjusted Kolmogorov-Smirnov test that compares the limits of random walks using samples with finite precision, allowing for numerical tests of scaled convergence of random walks. Finally, we establish convergence theorems for various test statistics under the assumption that the random walk converges. This provides numerical tools to investigate the convergence of self-repelling random walks.

Mentor(s):

Jon Peterson (Science); Julia Anne Garner (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 364
Presentation Time: Session 2: 11:30am-1pm

Determining success rates of antibiotics to treat BRD based on characteristics of cattle

Author(s):

Erica Long† (Agriculture)

Abstract:

Bovine Respiratory Disease, also known as BRD, is a highly transmissible bacterial and viral disease affecting both the lower and upper respiratory tract in both beef and dairy cattle. The disease has a high economic impact due to the cost of treatment, animal loss, and decreased feed efficiency. There are multiple bacteria that cause Bovine Respiratory Disease in cattle, including Mannheimia haemolytica, Pasteurella multocida, Histophilus somni, and Mycoplasma bovis. It is commonly a challenge for producers to choose a successful antibiotic treatment without knowing the exact cause of BRD in the animal. The objective of this project is to determine if there are factors regarding the individual animal which may be indicative of success rates of specific antibiotics. Data sets from beef and dairy farms in Indiana include information on BRD positive animals and their treatment history, age, feed intake, sex, etc. A random forest machine algorithm is utilized to discover patterns in the data, and those patterns will be used to give insight into treatment success in specific factors. This is the beginning stage of an experiment with an end goal of giving a percentage of treatment success based on information about an animal, which would provide choices to producers on choosing an antibiotic.

Mentor(s):

Tim Johnson (Agriculture); Eunice Centeno (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 365
Presentation Time: Session 2: 11:30am-1pm

Examining Private Well Water Quality

Author(s):

Alexis Lowe† (Engineering, Honors)

Abstract:

Abstract Redacted.

Mentor(s):

Caitlin Proctor (Engineering); Madeline Larsen (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 366
Presentation Time: Session 2: 11:30am-1pm

Role of Disease Risk Perception in Self Rated Health and Mortality

Author(s):

Samantha Maari† (Science)

Abstract:

Chronic conditions refer to the ongoing health problems that persist for an extended period, typically longer than three months, and may include diseases such as cancer, heart disease, and diabetes, among others. With the increased prevalence of chronic conditions, individuals develop a sense of perceived risk; an individual's belief of their likelihood of contracting the disease or illness. The purpose of the present study is to examine explanations of how perceived susceptibility to disease is associated with varying levels of self-rated health and mortality. We hypothesized that greater perceived risk of disease, such as cancer or heart attack, would predict lower self-rated health and greater morality risk. Data were from the second wave of the Midlife in the US (MIDUS) study (N=5,516). Participants were asked about their perceived risk of cancer or heart attack compared to others their age. Results were dichotomized into variables of “not perceived as high risk” and “perceived as high risk”. Results from logistic regression models showed that perceived risk of heart attack was an independent predictor of mortality over and above the other variables. Perceived risk of heart attack was also significantly related to worse subjective health. However, the models perceived risk of cancer was not significantly related to mortality or to SRH. These results suggest that the risk of heart disease gave participants a unique perception of their health and predicted mortality compared to the risk of cancer.

Mentor(s):

Elliot Friedman (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 367
Presentation Time: Session 2: 11:30am-1pm

Design and Development of an Inert Controlled Environmental Chamber for Indoor Dust Particle Analysis

Author(s):

Brian Magnuson† (Engineering); Zachary Limaye* (Engineering)

Abstract:

The key periods of infant motor development can be negatively and permanently affected by the exposure to, and ingestion of, harmful substances found in household dust. The physical and chemical characteristics of dust and other particulates found in indoor environments can be used to determine the specific infant ingestion rates and surface transfer behaviors. The experimental procedure is divided into four key processes, which are sample collection, sample packaging, characteristic analysis, and surface transfer analysis. For the surface transfer analysis stage, an inert controlled environmental chamber will house a robotic platform with the collected household dust samples to simulate the resuspension and surface transfer of dust in interactions between surfaces and objects. This chamber was constructed with inert materials to prevent contamination between experiments and fabricated with an airtight seal to ensure a consistent and controlled environment between all experiments. A Wideband Integrated Bioaerosol Sensor will be used to measure particle sizes and concentrations of resuspended dust particles during the robotic platform experiments. With the newly developed experimental method, this project expects to provide comprehensive data about the characterization of dust in indoor environments and identify the mechanistic behaviors of surface transfer and resuspension for dust and other particulates, which will contribute towards the EPA Exposure Factors Handbook.

Mentor(s):

Brandon Boor (Engineering); Nusrat Jung (Engineering); Jordan Cross (Engineering); Satya Patra (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 368
Presentation Time: Session 2: 11:30am-1pm

Associations between Weight Changes in Infancy and Preschool BMI

Author(s):

Elise Malehorn† (Pharmacy, Honors)

Abstract:

Research demonstrates that birth weight is associated with weight trajectories during infancy and early childhood. While prior literature has identified trends linking BMI trajectories across infancy to BMI in toddlerhood (ages 2-3), studies less often explore the association of these trends with BMI in the preschool years (ages 3-5). The purpose of this study was to: 1) evaluate whether child birth weight was associated with changes in BMI z-scores (BMIz) across 4 times points from 6 months – 4.5 years of age, and 2) examine whether birth weight, and changes in BMIz between 6, 12, and 18 months, were associated with BMIz at 4.5 years.

Participants' (N=110) birth weight was reported by parents. Child height and weight were collected by trained research staff and used to calculate age- and sex-specific BMIz at 6, 12, and 18 months, and 4.5 years of age. Change scores were created for BMIz between 6-12, 12-18 months, and 18 months - 4.5 years. Pearson correlations and regression analyses were used to test associations. Birth weight was associated with changes in BMIz between 6-12 months, but not changes in BMIz between other time points. Birth weight and changes in BMIz between 6-12, 12-18 months, and 18 months - 4.5 years were all associated with BMIz at 4.5 years. These findings support and expand on the prior literature indicating that birth weight and early weight trajectories are associated with BMI in preschool.

Mentor(s):

Kameron Moding (HHS); Elizabeth Kielb (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 369
Presentation Time: Session 2: 11:30am-1pm

Music-to-image generation

Author(s):

Maximilian Manzhosov† (Engineering); Brian Ng† (Engineering); Timothy Nadolsky† (Science); Haichang Li‡ (Science)

Abstract:

Music-to-image-generation is a relatively new and unexplored field in deep learning. While algorithms have been developed to generate new music or transfer an artist's style to another artist's painting (known as Neural Style Transfer), music-to-image generation has remained a relatively untouched field. Our team aims to develop an algorithm to depict images based on the type and genre of music it processes. We will use MusicBert, a large-scale pre-trained model for symbolic music understanding, to learn and extract music features of each genre as it is training on MIDI files to classify these genres correctly from each other. The genre classification will then be passed to ChatGPT to create textual descriptions. The system will then associate the identified music with images relevant to that genre using Stable Diffusion. Stable Diffusion, a deep learning technique that adds noise to an image, will then use these textual descriptions to produce a new image that matches the given textual description. Finally, the images will be visually inspected to evaluate the performance of the entire model and determine if more training is needed. In summary, we propose a music-to-image generation that uses Basic Pitch for raw audio to MIDI conversion, MusicBERT for MIDI to genre classification, ChatGPT for textual descriptions, and Stable Diffusion for textual description to image generation. Through our project, we not only aim to gain a deeper understanding of music and music genre classification but also bring closer the domains of music, image generation, and AI.

Mentor(s):

Yung-Hsiang Lu (Engineering); Purvish Jajal (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 370
Presentation Time: Session 2: 11:30am-1pm

Investigating Auto-Annotation Algorithms in the Analysis of Bacteriophage NedWong

Author(s):

Joshua Mariani† (Agriculture, Honors); Alvin Cai† (Engineering); Chase Weinstein† (Engineering); David Kim† (Agriculture); Kate Veltri† (Pharmacy); Mallory Motz† (Engineering); Mallory Zobel† (Engineering); Emily Andrews† (Agriculture); Emma Kane† (Agriculture); Emily Spicuzza† (Agriculture)

Abstract:

Bacteriophages are a type of virus that target and infect specific bacterial hosts, making them a potential solution in combating antibiotic resistant bacterial strains. To determine the potential use of a bacteriophage, the genes which comprise the bacteriophage must be analyzed using various programs. These programs generate auto-annotation reports which offer insight into the bacteriophage characteristics. These reports contain data which need to be cross referenced with other program reports to account for any gaps in information. The importance of utilizing various tools in genome editing is therefore critical in characterizing bacteriophages. One area of interest in these auto-annotated reports, involves coding potential, which is the likelihood that a portion of a bacteriophage's genome codes for a gene. Glimmer and GeneMark are tools from the DNA Master software that reference genes from previously annotated bacteriophages to predict areas of coding potential for incomplete bacteriophage genomes, known as draft genomes. The analysis of bacteriophage NedWong suggests that base pairs (bp) 5050-5400 contain lower coding potential than bp 8097-8249. However, when cross-referenced with reports generated from other annotation programs, it was suggested that a gene is more likely to exist in the former than the latter. This discrepancy with the DNA Master software drove further investigation into how annotation algorithms make their predictions, with the objective of exploring these programs' decision making process for acceptable coding potential sites. Understanding the reasoning behind these predictions may help with increasing the prediction power of genome annotation programs, thereby increasing the accuracy of bacteriophage annotations.

Mentor(s):

Kari Clase (Agriculture); Harry Ashbaugh (Engineering); Morgan Gyger (Engineering); Zhujin Xia (Engineering); Amanda Blankenberger (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 371
Presentation Time: Session 2: 11:30am-1pm

The role of shape and practice on reflexive spatial attention.

Author(s):

Jackson Masten† (HHS); Faith Allen† (Science)

Abstract:

When a second (target) stimulus immediately follows a first (cue) stimulus, people are faster to localize the target if it happens to be in the same location as the cue (as opposed to a different location). However, with larger temporal intervals between cue and target, this initial benefit becomes a disadvantage. These phenomena are called spatial attentional facilitation and inhibition of return (IOR), respectively. Some studies using a psychophysical approach (up to 5 sessions) have found these reflexive spatial cueing effects may depend on the shapes of the cue and target at short temporal intervals. We examine here whether we find spatial (facilitation and IOR) and shape cueing effects in a single session and whether these cueing effects interact with practice effects. We tested Purdue students on a modified attention task and recorded response times to localize the target. We found significant spatial facilitation up to a cue-target onset asynchrony (CTOA) of 150ms with significant IOR at 500ms. In addition we observed a significant shape-selectivity inhibition, but only at a single short CTOA. The findings, differences with prior literature, and implications for theories of attention will be discussed.

Mentor(s):

Anne Sereno (HHS); Daniel Larranaga (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 372
Presentation Time: Session 2: 11:30am-1pm

Stacking the Chip Vertically Using Micro-Bump Interconnects

Author(s):

Shresth Mathur† (Engineering)

Abstract:

As microelectronic systems become increasingly complex, the need for faster computing speeds and advanced semiconductor packaging methods has become apparent. Therefore, three-dimensional (3D) chip integration with fine-pitch, high-density micro-bump interconnections, and multi-chip stacks is showing great potential for the future. The objective of this study is to learn about the basics of microelectronic packaging and fabrication, as well as to optimize the pitch length and dimensions of the micro-bumps to achieve the highest possible interconnect density while keeping chip functionality intact. To understand microelectronic basics and 3D packaging technologies, informative group discussions and deep literature reviews were conducted over several weeks; then, a photomask design software was utilized to create different layouts of micro-bump sizes and pitches, which were subsequently fabricated in a clean room to be tested using electrodeposition experiments. These experiments revealed how different pitch lengths and dimensions affected the deposition of copper on the chip sample (how uniformly it was distributed), which is standard industry practice. Soon, reliability testing and failure modes analysis will be conducted on the chip samples using a variety of packaging reliability testing tools. Although no results have been found yet, reliability investigations will reveal how the different micro-bump pitch sizes and dimensions affect the overall chip in terms of heat transfer, material strength, and interconnect density. These findings will determine which micro-bump pitch lengths and sizes are most effective for the industry.

Mentor(s):

Tiwei Wei (Engineering); Shuhang Lyu (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 373
Presentation Time: Session 2: 11:30am-1pm

3D Printing Techniques for TENG Manufacturing

Author(s):

Conor McCarthy† (Engineering); Meghan Gron* (Engineering, Honors); Blake Iftiger* (Engineering); Justin Lesinski* (Engineering); Jacob Zendejas* (Engineering); Sai Pothireddy* (Education, Honors); Hongyi Shen* (Engineering)

Abstract:

The rise of the internet of things and wearable sensors have allowed Triboelectric Nanogenerators (TENG) to become focus for many researchers. TENG development has recently begun to utilize state-of-the-art 3D printing technologies to advance research. 3D printing technologies have enabled researchers to manufacture TENG devices with more complex architectures using a wider variety of materials. Fused Deposition Modeling (FDM), digital light processing (DLP), and Direct Ink Writing are the 3 primary methods of 3D printing for TENG devices. The FDM approach has been a popular technique due to its faster manufacturing time, lower cost, and ability to print complex structures.[2] DLP is another method being employed by researchers where resin is directly printed onto substrates. The material is then cured under a light projector. Similarly, Direct Ink Writing (DIW) has been utilized to print liquid material onto the substrate. Unlike FDM, there are no heating elements in these methods. There have been proven successes through these methods with recorded improvements in power density and output voltage. An example of this is seen when Tang and group used DIW methods to create TENG devices, they were able to power 88 LEDs while also acting as a mechanical and humidity sensor.[3] With the door now open for 3D printing as a beneficial technology, researchers turn to research the use of other 3D approaches for TENG and nanosystem manufacturing.

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Mentor(s):

Wenzhuo Wu (Engineering); Nachiket Vatkar (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 374
Presentation Time: Session 2: 11:30am-1pm

Comparing Differences in Telehealth Treatments by Momentary Stress Levels of Caregivers of Children with Prader-Willi Syndrome

Author(s):

Gracie McGloin† (HHS); Sydney Bergeron† (HHS)

Abstract:

Mental health is a major concern for caregivers of people with Prader Willi syndrome (PWS), however it is unclear which treatments are best suited to this population. Previous research identifies the psychosocial risk factors (Borne et al., 1999) and characteristics of PWS (Vice, 2018) that increase caregiver stress levels. They fail, however, to explore efficacious treatment options for this population. The present study aims to fill this gap by testing the efficacy of three telehealth therapies in PWS caregivers: Dialect Behavior Therapy (DBT), Acceptance and Commitment Therapy (ACT), and Integrative Behavioral Couples Therapy (IBCT). We examined data from Project WellCAST 2.0, which enrolled PWS caregivers in either 11 (ACT/IBCT) or 12 (DBT) week telemental-health treatment program, during which self-reported demographic (baseline) and ecological momentary assessment (EMA) (4 times a day, 7 days per week) data were collected; here, we focus on average first- and last-week data. We hypothesized that momentary caregiver stress levels would decrease across treatment, while stress levels would not significantly differ between treatment groups. Planned analysis includes paired sample t-tests to compare the first- to last-week change in symptoms. Our goal is to provide insight into how to properly utilize telemental-health services for high-risk caregivers of children with PWS.

Mentor(s):

Bridgette Kelleher (HHS); Veronika Vozka (HHS)

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Poster Presentation Abstract Number: 375
Presentation Time: Session 2: 11:30am-1pm

Thermal Analysis for High-Performance 2.5D Interposer Packages

Author(s):

Andrew Modin† (Engineering)

Abstract:

The thermal performance and reliability of high-performance 2.5D interposer packages used in advanced electronic systems remain a critical issue. Inadequate thermal management can lead to thermal damage, reduced performance, and shortened device lifespan. A comprehensive study was conducted using Ansys software to model cutting-edge 2.5D interposer packages and evaluate their thermal behavior and reliability compared to previous models to address this challenge. The study aimed to determine the thermal performance and reliability of optimized interposer designs, which include features such as high-conductivity thermal interface materials, through-silicon visas, and microbumps. The results demonstrate that the optimized designs can significantly reduce the peak temperature and improve thermal reliability, ensuring the reliable operation of advanced electronic systems and enhancing the user experience. The study also highlights the importance of proper thermal analysis in the design of interposer packages as they provide high-bandwidth and low-latency connectivity between different components in electronic systems which can fail with poor materials or the significant temperatures present in electronic systems. In conclusion, the study provides valuable insights into the optimization of 2.5D interposer package design and its impact on thermal management. The findings of this study have the potential to assist manufacturers in creating more advanced interposer packages and improving the overall reliability and performance of their electronic systems. These implications are particularly significant for industries such as telecommunications, computing, automotive, and aerospace, where the success of high-performance electronic systems is crucial.

Mentor(s):

Tiwei Wei (Engineering); Aidan Powers (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 376
Presentation Time: Session 2: 11:30am-1pm

Implementation and Verification of an Embedded Multicore Processor

Author(s):

Robert Murphy† (Engineering, Honors); Jimmy Jin† (Engineering); Pranav Jagada† (Engineering)

Abstract:

Increasing the performance of a uniprocessor (or unicore) design by increasing the frequency yields a cubic increase in power consumption with respect to the increase in performance. However, a multicore system achieves the same performance increase without an increase in frequency and therefore, only a linear increase in power. This is done by placing multiple processing cores in parallel to operate on different instructions simultaneously. Given the benefits of a multicore processor, such a processor - with a parameterizable number of cores - was created for the SoCET team's AFT-series microcontroller. To overcome the major obstacle of a multicore system, coherence, the MESI cache coherence protocol was implemented. Without coherence, data can be corrupted, due to the multiple on-chip memory locations possible for a given piece of data in the multicore cache hierarchy. In addition, synchronization for parallel programs is supported in the hardware architecture with an implementation of LR-SC from the RISC-V A-extension to ensure software programmability. Completeness and correctness of the system was verified using an industry standard method - Universal Verification Methodology (UVM). Through constrained randomized testing, the coherence control module has been confirmed to be functionally correct. The design is expected to be used in a dual core configuration and as such, is being evaluated and verified in this format. The full dual core UVM testbench is currently under development and will provide a modular framework to fully verify correct functionally of the integrated coherence controller, cache system and processor cores. The dual core system is currently being benchmarked against the uniprocessor implementation through computer simulation and hardware testing in a lab. Program throughput and physical area requirements are the quantitative measurements that will be compared.

Mentor(s):

Cole Nelson (Engineering); Mark Johnson (Engineering); Sarang Pramod (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 377

Presentation Time: Session 2: 11:30am-1pm

Analysis of 4D Cardiac Magnetic Resonance(CMR) Images to Identify Strain Parameters for Early Mortality in Duchenne Muscular Dystrophy (DMD)

Author(s):

Tarun Nandamudi† (Engineering)

Abstract:

Duchenne Muscular Dystrophy (DMD) is an ultimately fatal genetic disorder where a mutation in the dystrophin gene causes the degradation of the skeletal and cardiac muscles and subsequent cardiovascular issues for patients throughout their life. Currently, there are no curative options for patients with DMD, although there are treatment options to treat mobility issues such as corticosteroids and physical therapy. Due to the nature of DMD, there is little information available for doctors to use when tracking the progression of the disorder and the patient’s prognosis. The overarching research project, led by Ph.D. student Conner Earl, aims to create a deep learning algorithm that will analyze 4D cardiac magnetic resonance (CMR) images of patients with DMD, and present physicians with more sophisticated cardiac parameters to predict patient prognosis. This research study's objective was to analyze various 4D CMR images using a custom MATLAB graphical user interface to identify strain parameters that associate with early mortality in DMD. Data was collected by physicians at the Vanderbilt Children’s Hospital and sent to the Purdue CardioVascular Imaging Research Laboratory (CVIRL) for analysis. Initial results from a subgroup of DMD patients with mortality within 5 years of imaging (n=9) showed a significantly decreased global surface area strain compared to DMD patients who survived past 5 years of imaging (n=40; p<0.0001). We hypothesize that further analysis including a larger subset of DMD patients with early mortality will also demonstrate decreased surface strain. These results will be valuable for better understanding the progression of DMD and allow physicians to use these advanced metrics for predicting outcomes.

Mentor(s):

Craig Goergen (Engineering); Conner Earl (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 378
Presentation Time: Session 2: 11:30am-1pm

3D Printed Morphing Membranes for Variable Selectivity

Author(s):

Jared Nathan† (Engineering, Honors); Aditi Edlabadkar* (Engineering)

Abstract:

The field of water membrane technology is dedicated to the separation of particles from water, through semipermeable membranes. These membranes are a central component of numerous industries, from food processing to water desalination. However, membranes used are static, with one pore size and state used throughout their entire operating life. This limits the applications of membranes, as they cannot dynamically change selectivity or pore size in response to different use requirements. The goal of this study is to develop a morphing membrane with the ability to change pore size in response to an external stimulus of tensile stress, based on a kirigami structure. This structure uses a series of alternating slits to create a material that can expand and fold in unique ways. Although prior methods have been developed to create a morphing membrane, none use a systematic repeated structure with definite pore size.

The membranes are manufactured using 3D printing in order to develop high fidelity patterns at the correct scale. To test their functionality, a feed solution of polystyrene beads and water will be passed through the membrane and permeate will be collected at the outlet. Analyzing the change in concentration between the feed and permeate will allow for testing of the selectivity of the membrane under various levels of tension, and thus different pore sizes.

If successful, this technology can be adapted to respond to changes in other parameters, like humidity and temperature, and can be used in biological cell sorting, passive dehumidification and more applications.

Mentor(s):

David Warsinger (Engineering); Andres Arrieta (Engineering); Matt Boston (Engineering); Mojtaba Zarei (Education)

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Poster Presentation Abstract Number: 379
Presentation Time: Session 2: 11:30am-1pm

Human Cdc14 Phosphatase Stimulation by a Pseudosubstrate Motif

Author(s):

Noelle Naughton† (Agriculture)

Abstract:

Cdc14 is a widely conserved eukaryotic protein phosphatase from the dual-specificity subfamily of protein tyrosine phosphatases and regulates diverse cellular processes such as mitotic exit, cytokinesis, and DNA repair in different species. Cdc14 has been linked to hearing loss and male infertility in humans and mice, while in multiple fungal species Cdc14 has been linked to pathogenesis. Our lab is interested in understanding the catalytic mechanism, regulation, and biological functions of Cdc14 enzymes. Recently, we discovered a pseudosubstrate motif in all fungal Cdc14 enzymes that plays an important role in the catalytic cycle by binding the active site to stimulate the rate-limiting phosphoenzyme hydrolysis step and provides a mechanism for cells to regulate Cdc14 activity. While this pseudosubstrate motif is not conserved in animal Cdc14 enzymes, AlphaFold predictions of human Cdc14 structures reveal a different motif interacting with the active site that is well conserved in metazoan Cdc14 orthologs and could perform a similar function. The goal of my project was to test if this motif is mechanistically similar to the fungal pseudosubstrate motif. To accomplish this, I created mutations in residues predicted to bind in the Cdc14 active site based on the AlphaFold structure and tested their effect on enzyme activity compared to wild-type Cdc14 using steady-state kinetic assays. I observed a reduction in both the kcat and Km, very similar to the effects observed with mutations in the fungal motif, and most consistent with a contribution to the rate-limiting catalytic step. These data confirm the predicted pseudosubstrate motif in human Cdc14 acts in the same way as the previously characterized fungal motif and implies that all Cdc14 enzymes use a pseudosubstrate motif in their disordered C-terminus to stimulate and regulate activity. Future work will focus on understanding the biological significance of the pseudosubstrate motif in Cdc14 enzymes.

Mentor(s):

Mark Hall (Agriculture); Kedric Milholland (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 380
Presentation Time: Session 2: 11:30am-1pm

Time-correlated single photon counting setup development

Author(s):

Long Nguyen† (Engineering); Tam Le† (Engineering)

Abstract:

Single photon counting measurements is an integral procedure in various Photonics/Optoelectronics experiments. However, many standard software for conducting experiments lack modularity and ergonomics; This hindrances greatly reduce the speed of gathering data and measuring. This paper introduces an efficient way to organize software drivers for many optical setups that enable physicists and technicians to gain better working experiences. The method used in this project is to create a homogenous wrapping middleware written in Python that organize and call lab equipment's low level .NET dynamic linked library(dlls) to a customed design GUI so that GUI and other's front-end components can just call identical commands from wrapping middleware without having to deal data read/write desynchronization, signal aliasing, noise/distortion. The preliminary result has been promising, The middleware library has been able to coordinate Thorlabs BPC 303 Piezo Controllers and GVS012 Galvo system to perform efficient Photoluminescence mapping of sub-micron substrate. The middleware can also receive commands and sending data to a GUI efficiently, even though there exist some mismatch of read/write operations (This is currently being solved through implementing multithreading and buffer allocation for data transportation). The in-progress result proves that writing efficient software for optical data acquisition and experimentation is possible and this can open up possible commercialization and licensing of this project software if everything is well optimized.

Mentor(s):

Samuel Peana (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 381
Presentation Time: Session 2: 11:30am-1pm

Classification of electronic and nuclear recoil events in XENONnT detector using convolutional neural networks

Author(s):

Owen Odney† (Science); Shivam Raj† (Science); John Burns† (Science)

Abstract:

The search for dark matter has led to many different types of detection techniques developed, all unsuccessful, including the XENONnT experiment. Using a time projection chamber (TPC) of liquid and gaseous xenon, XENONnT hunts for weakly interacting massive particles (WIMPs) as a source for dark matter. If they do exist, WIMPs should enter the TPC and interact with the liquid xenon either via electronic recoil (ER) and nuclear recoil (NR), with NR being the expected dominant process. Each NR and ER event has two phases: an initial short burst of light (S1) and a longer drift of electrons that release light on the top of the TPC (S2). Adjusted S1 and S2 signals are a useful way to distinguish between NR and ER, but this process uses humans and is often slow and time consuming. This research project will focus on creating and using a convolutional neural network (CNN) to distinguish between NR and ER events using S1 and S2 waveform data. We will outline the steps to transform the waveform data into a usable form for the CNN. We will then explain what our CNN does and the different variations of it we will use in our research. We will finally explain the results of the CNN and determine whether this approach is a viable option to automatically distinguish NR and ER events.

Mentor(s):

Rafael Lang (Science)

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Poster Presentation Abstract Number: 382
Presentation Time: Session 2: 11:30am-1pm

Elementary Students' Reengagement After Failure: A Developmental Approach

Author(s):

Kourtney Otte† (Agriculture); Bronwyn Rigsby† (Education)

Abstract:

There is a recent push to normalize failures in educational settings. However, most studies focused on failure in the classroom have measured students' reactions to hypothetical failures, not experienced ones. Further, little is known about how younger students (i.e., elementary) react to failure. Therefore, the purpose of this study was to investigate students' motivation to reengage in a task re-engagement after a failure. Further, we sought to understand potential developmental differences in re-engagement. Data were collected from two 1st-grade (n = 45) and two 4th-grade classrooms (n = 28). Students were asked to complete a developmentally appropriate lateral thinking puzzle as a small group within a set time limit. The time limit was intentionally short to ensure that the teams did not complete the puzzle in time (i.e., objective failure). After the completion of time, students were asked to privately choose whether they would like to continue with the puzzle. They then shared their responses with reasons, and students who wanted to complete the puzzle were given time to do so. Student responses were recorded and then transcribed. These transcriptions are being qualitatively coded by a team of

researchers for themes and patterns, and preliminary results are expected by the conference. The findings from this work are important to understand. As teachers begin to introduce failure opportunities in their classes, they may unintentionally reduce student motivation to participate in learning activities.

Mentor(s):

Calah Ford (Education)

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Poster Presentation Abstract Number: 383
Presentation Time: Session 2: 11:30am-1pm

Does energy efficiency actually reduce environmental impacts? Efficiency concepts in US infrastructure and environment laws

Author(s):

Ingrid Owczarzak† (Engineering, Honors)

Abstract:

High efficiency systems are often presented as a solution to negative environmental impacts, such as modifying engines to produce less emissions. However, increased efficiency can cause unforeseen problems, such as A) overuse, when a system is used at a greater capacity than originally predicted or B) offshoring, when system processes are completed in other places causing adverse environmental effects elsewhere. When making environmental projections it is important to explore the potential for these feedback effects within current economic and environmental policies. New government policies, the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA), seek to implement programs with goals of environmental efficiency. These acts, passed for a multitude of economic and infrastructure reasons, may overlook the feedback effects of raising efficiency and risk missing environmental targets. Through systematic review of official policy documents and third-party policy analyses, we will seek to understand the awareness of governmental and advocacy groups when passing policies such as the IIJA and IRA. We will look at the budgeting of the IIJA and IRA to determine which programs contain efficiency claims and examine whether conflicts are acknowledged and accounted for in the policy process. We code each environmentally-oriented sub-program of the IIJA and IRA with a budget in billions, explicit or implicit emissions statements, and whether efficiency-coded words are included in program language. Information will be found on what percent of the budget has efficiency claims and we will discuss the feedback effects of efficiency in these policies.

Mentor(s):

John Mulrow (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 384
Presentation Time: Session 2: 11:30am-1pm

Exploration into possible selective AC8 inhibitors in the treatment for anxiety-related disorders and alcoholism.

Author(s):

Laura Payne† (Pharmacy)

Abstract:

Adenylyl cyclases (ACs) are enzymes that work as effectors in G protein-coupled receptor (GPCR) signaling and are critical components in the production of second messenger cAMP. Group 1 adenylyl cyclases are comprised of AC1, AC3, and AC8 which are characterized by Ca2+-dependent stimulation via calmodulin (CaM). Both AC1 and AC8 have been found to be highly expressed in neuronal tissues such as the hippocampus. Both AC8 and AC1 have unique CaM binding sites, supporting the ability to target one AC isoform over the other selectively. Previous studies using AC1/AC8 KO mice have indicated that the loss of both isoforms leads to memory loss; however, if either the AC1 or AC8 isoform is present, this memory loss is absent or very modest. Mice deficient in only AC8 have shown less alcohol consumption and are resistant to stress-induced anxiety. Therefore, the discovery of a selective inhibitor for AC8 could allow us to treat anxiety-related disorders and alcoholism, which are prevalent concerns that affect many in the US. Moreover, the side effects associated with current treatments for these disorders suggest that the identification of a novel therapeutic agent could be paramount in discovering a safer method for treating anxiety and alcoholism.

Mentor(s):

Val Watts (Pharmacy); Tiffany Dwyer (Pharmacy); Brenton Smith (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 385
Presentation Time: Session 2: 11:30am-1pm

XRF Analysis of Lead in Drinking Water

Author(s):

Jackson Pechin† (HHS, Honors)

Abstract:

The purpose of this study was to determine the feasibility of quantifying lead in drinking water using X-ray fluorescent (XRF) spectroscopy. A method was recently developed to measure lead in drinking water by draining drinking water collected in 2-liter plastic bottles through an activated carbon filter, which was scanned with a XRF spectrometer. This study determined that concentrations of lead lower than the EPA drinking water action level of 15 ppb could not be quantified but could be detected using this method. The lowest concentration of lead this method was able to detect was 2 ppb. This method will be used to determine and map the presence of lead in Martinsville, Indiana where there is an EPA superfund site and community concern about heavy metals in the drinking water.

Mentor(s):

Sa Liu (HHS); Jung Hyun Lee (HHS); Alaina Bryant (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 386
Presentation Time: Session 2: 11:30am-1pm

QUIP (Quantum Integrated Project) - Circuit Design

Author(s):

Stanislav Pelipad† (Engineering)

Abstract:

Photonic circuits are a type of circuit that uses photons instead of electrons to carry information. In contrast to traditional electronic circuits, photonic circuits are typically faster and more efficient making them useful for applications in optical communications, sensing, and computing. One of the challenges in developing photonic circuits is the complexity of the design process, which typically involves multiple iterations of designs and lengthy simulation times. The proposed method in this project uses existing Python libraries to enable researches to rapidly design, test, and optimize photonic circuits. The workflow involves using GDSFactory to design the photonic circuit or circuit component and SAX circuit simulator to perform simulations. By simplifying the design process, the proposed method enables researchers to rapidly design and test circuits rather than write scripts to perform lengthy and detailed simulations.

Mentor(s):

Lucas Cohen (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 387
Presentation Time: Session 2: 11:30am-1pm

Effects of Rotor-Screen Gap on Granule Size in Dry Granulation

Author(s):

Jayden Pierce† (Engineering)

Abstract:

Dry granulation is a type of pharmaceutical tablet manufacturing process in which powders are turned into granules without adding a liquid binder. Compared to wet granulation, it is ideal for materials that are sensitive to heat or moisture. The roller compactor is the key unit operation in the dry granulation process and has two steps. First, powders are compacted into ribbons by two counter-rotating rolls. Furthermore, the ribbons are crushed into granules in the following milling step. This process is essential in the tablet manufacturing process because the size of the granules has varying effects on tabeletability and flowability, both of which significantly affect tablet properties such as content uniformity and tablet hardness. In this work, the impact of the rotor-screen gaps in the milling step on granule size will be investigated. Granules will be manufactured with varying rotor-screen gaps and roll pressure. The Canty Solidsizer will then be used to measure the granule size distribution. Analysis of the granule size distribution will be performed using Matlab. Preliminary results reveal that there are differences in granule size among the different rotor-screen gaps. Once the effects of the rotor-screen gap on granule size are understood, we will gain an additional factor in optimizing granule size, thus optimizing tabeletability and flowability.

Mentor(s):

Yan-Shu Huang (Engineering); Yan-Shu Huang (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 388

Presentation Time: Session 2: 11:30am-1pm

Psychological Wellbeing in Migrant and Immigrant Rural Latinx Youth in the Midwest

Author(s):

Anastasia Pinopoulos† (Pharmacy, Honors)

Abstract:

During migration Latinx youth often encounter both physical and psychological violence that can be detrimental to wellbeing and adjustment. Adverse experiences can increase symptoms of anxiety, depression, and loneliness in individuals. Individuals often rely on social support from their family, friends, and others in order to combat these feelings. The study purpose was to examine differences in psychological wellbeing between first and second-generation Latinx youth (those born in the U.S versus those who immigrated after the age of five) using mixed-method data.

We used preliminary data from the Purdue Puentes Project (PIs: Ruiz & Taylor), an on-going longitudinal study of rural immigrant Latinx youth ages 10-15 and their families in the Midwest (N = 210, Mage=13.10, males=52.9%). We tested mean differences in wellbeing by immigrant status using SPSS. Results demonstrated no differences between first- and second-generation youth in anxiety, depression, and loneliness, although girls were significantly higher on depression. However, there were significant differences for second-generation youth reports of neighborhood social cohesion, friend support, and support from a special friend (all lower). There were no differences between groups for family support. In interviews, the participants provided stories about their immigration story and explained how immigrating has impacted their families and their self. Latinx youth reported feeling scared due to the uncertainty and newness of migrating to the United States.

Results suggest the need to further explore reasons for lower perceptions of friend and community support for immigrant youth (compared to their non-immigrant peers), especially considering the developmental implications of adolescence.

Mentor(s):

Zoe Taylor (HHS); Yumary Ruiz (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 389
Presentation Time: Session 2: 11:30am-1pm

Triboelectric Nanogenerators for Wound Healing

Author(s):

Saichandana Pothireddy† (Engineering, Honors); Meghan Gron‡ (Engineering); Blake Iftiger‡ (Engineering); Conor McCarthy‡ (Engineering); Jacob Zendejas‡ (Engineering); Justin Lesinski‡ (Engineering); Hongyi Shen‡ (Engineering)

Abstract:

Wound healing is a complex physiological process regulated by various forms of intercellular signaling between many cell types. Delayed or non-healing wounds are wounds that have failed to undergo the full process of structural and functional closure, and the treatment of non-healing wounds are currently considered a highly unmet clinical need [1]. These chronic wounds can be compromised by infection and result in complications such as scarring, hemorrhage, or damage to surrounding tissues [2]. Treatments that influence cell behavior can be beneficial in stimulating and accelerating the wound-healing process, such as the use of electrical stimulation. A viable technology for stimulating the process of wound healing is triboelectric nanogenerators. Triboelectric nanogenerators (TENG) are an emerging technology that can convert mechanical energy, including motions of the human body, into electricity through the generation of surface charges from friction and induction of these surface charges [3]. The application of TENGs for wound healing has been primarily focused on the development of wearable TENGs that assist the wound healing process through various mechanisms, such as electrical stimulation and promoting antibacterial activity [4, 5]. Due to their small size, flexibility, biocompatibility, and viability as a sustainable energy source, TENG devices are a promising technology for self-powered wound healing therapies.

Mentor(s):

Wenzhuo Wu (Engineering); Nachiket Vatkar (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 390

Presentation Time: Session 2: 11:30am-1pm

Daily Study of Relationship Experiences and Stress

Author(s):

Nitya Prabhakar† (HHS, Liberal Arts, Honors)

Abstract:

The COVID-19 pandemic has had significant impacts on both physical and mental health and well-being. This study aims to investigate the relationship between agreement on pandemic guidelines between romantic partners, vaccination status, and stress levels among individuals in the United States during the pandemic. Specifically, the research question is whether couples who agree on pandemic guidelines and individuals who are vaccinated have lower stress levels than those who disagree or are unvaccinated. The study draws data from an ongoing study of stress, substance use, and partner relationships during COVID-19 (DISTRESS). I hypothesize that the uncertainty, fear, and isolation associated with the pandemic have led to increased stress levels, which subsequently have negative effects on physical and mental health. Data on levels of disagreement between romantic partners regarding COVID-19 guidelines, stress levels, and vaccination status have been collected through the aforementioned study, DISTRESS. Correlations between these variables will be analyzed using regression models. This study could inform interventions and support programs that target those most in need, as well as public health messaging and interventions aimed at stress reduction and promoting adherence to pandemic guidelines. It is important to note that potential limitations of the study include self-reported data and potential sample bias. Overall, we anticipate that this study will provide valuable insights into the effect of pandemic regulations on intimate partner relationships and identify individuals most at risk for stress-related health problems during the pandemic.

Mentor(s):

Susan South (HHS); Samantha Dashineau (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 391
Presentation Time: Session 2: 11:30am-1pm

Transforming Patient Health Information Exchange with Blockchain Technology

Author(s):

Diya Prasanth† (Science); Gustavo Franzener Goncalves da Silva† (Engineering)

Abstract:

Achieving health equity while ensuring operational efficiency of various healthcare organizations is still a work in progress, which can be strengthened by the development of innovative information technology. This project aims to build one of the first permissioned blockchain based reliable information sharing platforms among clinics. Blockchain technology was chosen due to the sensitivity of the information being stored and its capability to protect against security risks. Due to a single clinic lacking the data and the computing power to build accurate AI models, this type of blockchain technology is expected to be beneficial to patient health management.

We adopted the Tendermint platform to build the consensus and network layers of the proposed blockchain application, while we leveraged the Cosmos SDK framework for the application. We applied the Inter-Realm Industry Trust Alliance (IRITA), a part of the Cosmos ecosystem, to achieve the permissioned requirements. We implemented a Proof of Authority module to establish that each clinic is an authorized node validating new blocks into the chain. We simulated a wide range of data on patient health status and added them to the chain. This data includes care needs and service utilization, which would be collected by each clinic.

Mentor(s):

Nan Kong (Engineering); Baijian Yang (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 392
Presentation Time: Session 2: 11:30am-1pm

Effect of resistance training and dietary protein modification on skeletal muscle mass and strength in older adult women

Author(s):

Sarah Preston† (HHS, Honors); Rebecca Lewis* (HHS); Chloe Garrett* (Honors); Hannah Winstone* (HHS); Lucas Stouder* (HHS); Johnny Vanos* (HHS)

Abstract:

We assessed the effects of consuming a U.S.-Style Healthy Dietary Pattern (HDP) with higher protein predominantly from lean beef, compared to a HDP with normal protein or higher protein HDP lower in beef on changes skeletal muscle mass and strength in older women who performed resistance training (RT) for 12 weeks. For this investigator-blinded study (Purdue IRB 2019-218), 36 healthy women (age: 66±1 y) were randomized to consume a U.S.-Style HDP with: 1) high-protein emphasizing unprocessed lean beef (HP-Beef, 1.4g/kg body weight/d); 2) HP with mixed protein sources (HP-Mixed); or 3) lower-protein (LP-Mixed, 0.8g protein/kg BW/d). We hypothesized that consuming the HP-Beef diet would augment improvements in skeletal muscle mass and strength compared to the other diets. Muscle volume was assessed using magnetic resonance imaging (MRI) of the quadriceps (thigh) before and after the 12-week intervention. Muscle mass and strength increased with time (p<0.05, main effect). Contrary to our hypothesis, a HDP with higher protein intake did not impact muscle mass (LP-Mixed: 5.3±1.7% and HP-Mixed: 9.3±1.5%) or strength (LP-Mixed: 35±9% and HP-Mixed: 45±6%) associated with RT. Further, adding beef to a high-protein diet did not lead to a greater increase in muscle mass (HP-Beef: 6.6±1.7%) or strength (HP-Beef: 30±9%) compared to the other diets. A greater daily dietary protein intake did not enhance RT-induced increases in skeletal muscle mass or strength in older adult women. Still, the Dietary Guidelines for Americans recommends that older women habitually consume a HDP to promote skeletal muscle health.

Mentor(s):

Chad Carroll (HHS); Nathan Campbell (HHS); Camila Reyes (HHS); Wayne Campbell (HHS); Anna Barker (HHS)

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Poster Presentation Abstract Number: 393
Presentation Time: Session 2: 11:30am-1pm

Mapping Heavy-Ion Ionization in Microelectronics Using Pulsed Bessel Beams

Author(s):

Mathias Pretet† (Engineering); Trent Bloor‡ (Engineering)

Abstract:

Heavy ion radiation is a common source of damage to spaceflight microelectronics, and testing to predict device response and prevent impactful damage has been an essential part of successful spaceflight. While experimental methods using heavy ion accelerators exist to test the radiation effects on microelectronics, they are often too expensive to be widely applicable in laboratories. Similarly, Gaussian pulsed laser beams have been a popular alternative due to their cost-effective setup but fail to accurately quantitatively predict the effects of heavy ion radiation. The object of this research is to design a cost-effective system that addresses the weaknesses of Gaussian pulsed laser beam modeling. Transforming the traditional Gaussian beam into a Bessel beam allows for uniform intensity throughout the device under test, which effectively reflects the carrier distribution induced by heavy ion radiation. Implementing an axicon into the testing design is one solution to generating a Bessel beam explored in this research. Preliminary simulations have confirmed the possibility of approaching this problem using Bessel beams. Conducting further testing and analysis will enable the design of a physical experiment and physical testing to begin.

Mentor(s):

Peter Bermel (Engineering); Allen Garner (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 394
Presentation Time: Session 2: 11:30am-1pm

Simulating an Autonomous Vehicle using Machine Learning Techniques

Author(s):

Amritanshu Ranjan† (Engineering); Pranav Kolady† (Engineering); Aaditya Pai† (Engineering); Sanjeev Kummarapurugu† (Engineering); Shashank Sridhar† (Engineering); Archis Raykar† (Engineering)

Abstract:

This project aims to simulate an autonomous vehicle that can learn the course of a path and avoid static obstacles using machine learning (ML) techniques. The end product will be able to safely navigate through multiple tracks with unique paths and obstacles. There are three components to the project: the ML model, simulation, and obstacle-avoidance algorithms. The ML model uses deep learning, specifically convolutional neural networks (CNNs), for path learning. The CNN contains 2D convolutional, fully-connected, and dropout layers, with each layer using the Exponential Linear Unit (ELU) activation function. The fully-connected layers define the steering angle that the vehicle should use. The simulation will be run on Udacity's Self-Driving Car Simulator and includes real-world sensor modules for data collection. The Simulink simulation will use a physics-engine based on the MOBATSim framework and will emulate typical traffic situations in which the vehicle will use autonomy in accordance with other vehicles on the road. This will be used to simulate typical radar and LiDAR sensors. Lastly, the vehicle will use object detection algorithms to maneuver around obstacles that will impede its path. The end goal of this product serves as research on how to train autonomous vehicles to navigate through paths and obstacles using deep learning.

Mentor(s):

Samuel Labi (Engineering); Richard Ajagu (Engineering); Shreya Ghosh (Engineering)

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Poster Presentation Abstract Number: 395
Presentation Time: Session 2: 11:30am-1pm

Optical Viewing Environment for the NASA Solar Cruiser Mission Context Camera

Author(s):

Ishaan Rao† (Engineering, Honors); Becca Reinecke† (Engineering); Mark Kosmerl† (Engineering); Sam Smith† (Engineering, Honors); Ashwin Limaye† (Engineering); Cristina Macias† (Engineering); Sophie Witters† (Engineering); Sathvik Srikanth† (Management)

Abstract:

The VIP Solar Sail team is designing and testing the context camera and software system for NASA's Solar Cruiser mission. At the Earth - Sun Lagrange point 1, Solar Cruiser will demonstrate the largest solar sail used for propulsion. The context camera monitors the deployment of the sail, as well as measure performance during the mission. The Simulated View (SimView) team replicates the optical environment of space in the laboratory to test and develop the camera system. The laboratory model includes a scale sail model, a sun simulating light source, and a deep-space backdrop. The sail model is constructed from fire blankets. The light source is a high luminosity stadium light with similar color temperature to the sun, mounted on an adjustable stand above the sail model. The backdrop consists of 8 melamine panels painted with Muoso Black and mounted into a pinewood frame. Muoso Black absorbs 99.8 percent of light, allowing the model to match the high contrast between the highly reflective foreground and dark background expected during the Solar Cruiser mission. The sail model and sun simulation were completed in previous semesters. This semester, SimView painted the melamine panels first with a paint roller and then with an airbrush to minimize inconsistencies. Finished panels were then installed into the pinewood frame constructed this semester, completing the backdrop. Various test images with different light incidence angles and sail bowing were taken to test the setup. Images were also sent to the software team to test the image analysis system.

Mentor(s):

Tony Cofer (Engineering); Alina Alexeenko (Engineering); Andrew Binder (Engineering)

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Poster Presentation Abstract Number: 396
Presentation Time: Session 2: 11:30am-1pm

Evaluating the effects of a high calcium gypsum amendment on soil carbon bioavailability and soil microbial activity

Author(s):

Ella Robinson† (Agriculture)

Abstract:

Calcium can influence the bioavailability of soil organic carbon (SOC) and calcium-containing soil amendments may, thus, serve in managing SOC in agricultural land. Soil calcium and SOC are positively correlated in alkaline soils, and higher levels of SOC indicate better fertility and soil properties, such as enhanced structure, nutrient capital, water holding capacity, and resources for soil biota. The aim of my research is to assess the influence of calcium on the quality of SOC formed during the decomposition of corn stover and the impact calcium has on the microbiome structure. We performed a 3-week incubation with soil microcosms amended with and without gypsum and corn stover in a fully factorial design. We measured soil respiration, total SOC, and analyzed the leachate for total dissolved carbon and performed 16S rRNA gene sequencing of soil DNA extracts. Once complete, we will identify the effects of calcium on our response variables. We hypothesize that adding gypsum ($CaSO_4$) will lead to reduction in SOC bioavailability that produces observed reductions in respiration, the dissolved organic carbon content in soil leachate and an increase in soil bacteria that specialize in colonizing insoluble forms of organic matter. Our findings will inform the use of gypsum, or other calcium-containing soil amendments, as a potential lever on SOC cycling which may help farmer adopt climate-smart practices to store carbon in their soils.

Mentor(s):

Roli Wilhelm (Agriculture)

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Poster Presentation Abstract Number: 397
Presentation Time: Session 2: 11:30am-1pm

Characterizing the Behavior of Cold Denatured Pea Protein Emulsions

Author(s):

Natalia Rodriguez† (Agriculture, Engineering)

Abstract:

Pea protein has good functionally in food (gelation, emulsification, etc.) and low environmental impacts. At low temperatures, proteins spontaneously unfold by cold denaturation, exposing hydrophobic regions in the protein's structure, which should lead to stronger protein-lipid interactions and stable emulsions. However, no research has studied emulsifying properties of cold-denatured pea protein. To bridge this gap, pea protein was treated using combinations of shear forces, ethanol, or low temperatures, and emulsions made using the treated protein powder. Emulsions were prepared at pH 3 or 8, protein concentrations of 0.5%, 1%, or 5%, with 0.2% xanthan gum and an oil volume fraction of 0.25. Emulsions and treated proteins were rheologically and physiochemically characterized over time using creep and small amplitude oscillatory shear (SAOS) experiments, solubility measurements, zeta-potential, and surface hydrophobicity. Two rheological models, the Burger model and Jeffery model, were used to quantify creep data, where the Jeffery model explored the oscillatory creep-ringing behavior seen at the start of creep experiments. In general, emulsions prepared with unaltered pea protein were stiffer than the cold-denatured proteins at all pH and concentration levels, though they were less stable over time. At pH 8, emulsions changed less than pH 3, driven by electrostatic interactions with the xanthan gum in the system. The hydrophobic surface area, solved experimentally and validated bioinformatically, also correlated well to the change in rheological properties at pH 3 and high protein concentrations. This work suggests that cold-denatured plant proteins may help stabilize food emulsions including salad dressings, mayonnaise, and others.

Mentor(s):

Jozef Kokini (Agriculture); Harrison Helmick (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 398
Presentation Time: Session 2: 11:30am-1pm

Soybean Genetic Mapping of Protein Mutations

Author(s):

Astrid Rodriguez Leon† (Science)

Abstract:

Soybeans are utilized in various industries for their protein and oils. New soybeans with high protein or high oil content can be used for health, agricultural, fuel and other purposes. Studying soybean seed development and genome can aid in the betterment of soybean production and increase yield of more advantageous soybeans. We have discovered several different high protein soybean mutants through a seed-based screen. To further understand the genetics in these mutants, we performed a seed development time course in the growth chamber. To identify the gene involved in the high the high protein trait, we made a mapping cross between our mutant and two other cultivars (Prize and CLOJ). Preliminary mapping suggests that the gene resides in either chromosome 4 or 10. The purpose of this project is to map the exact location of this gene for further knowledge in how the gene impacts protein production and how to employ it to our advantage. Part of this work requires developing new PCR markers to use in mapping in these populations. These markers will help narrow down the genetic interval where the mutation is located.

Mentor(s):

Karen Hudson (Agriculture); Militza Carrero-Colon (Agriculture)

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Poster Presentation Abstract Number: 399
Presentation Time: Session 2: 11:30am-1pm

Chlorophyll Vibrational Spectroscopy

Author(s):

Sajal Salim† (HHS)

Abstract:

Current methods of biofuel productions are not efficient and don't meet the global demand for clean energy. Understanding how photosynthesis works can help us get a clear understanding on how to optimize the efficiency of biofuel production and minimize waste, to provide a cleaner and more sustainable source of fuel. Extensive research on photosynthesis and how chlorophyll converts light to energy has been done. By gaining a deeper understanding of the vibrations and structure of chlorophyll we can gain insight on how the mechanism of photosynthesis works. To address this gap, I have been using infrared spectroscopy to study the vibrational structure of chlorophyll a in a variety of environments. First, we collected spectrum in a variety of solvents so that we can identify the approximate position of chlorophyll a vibrational peak between the 1500 cm-1 1750 cm-1 region. Then we have been working to extract the absorption spectrum of chlorophyll from a reconstituted water-soluble chlorophyll protein (WSCP) and have seen chlorophyll peaks at 1718 cm-1 and 1730 cm-1. These preliminary studies pave the way on our study of how site directed mutagenesis changes chlorophyll vibrational properties. By determining the spectrum of chlorophyll, we can gain an insight into the molecular properties and factors of chlorophyll that can be used to optimize efficiency of photosynthesis and develop more sustainable methods for producing biofuels.

Mentor(s):

Mike Reppert (Science); Jacob Wat (Science)

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Poster Presentation Abstract Number: 400
Presentation Time: Session 2: 11:30am-1pm

In the Splash Zone: Transforming Marine Energy into an Accessible Topic for Children

Author(s):

Nikitha Sam† (Engineering); Ryan Shepherd‡ (Engineering); Mayur Srinivas* (Engineering, Honors)

Abstract:

While water is Earth’s most abundant resource, marine energy is a topic that is overlooked by many. Specifically, marine energy, both theory and application, is an unexplored topic in most elementary and middle school curriculum, which prevents students from developing an early interest in a promising field. The complexity of the theory, and the socioeconomic barriers to education, are two important barriers to consider when attempting to reach out to a younger audience. We seek to break down the theory behind marine energy into a digestible, interactive, and engaging topic for middle school students, while creating a replicable and teacher-friendly lesson plan. Through intensive exploration of state curriculum, and conversations with seasoned teachers and local middle schools, we aim to bring marine energy topics out of textbooks and into the classroom. By creating a short lesson plan that is split into a presentation, a group activity, and a testing phase, we will test student’s ability to grasp complex topics of energy while maintaining their attention. While there are many factors that create a harmonious learning environment, we will focus on students’ engagement, material costs, and the rate of successful activities as an indication of success.

Mentor(s):

David Warsinger (Engineering)

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Poster Presentation Abstract Number: 401
Presentation Time: Session 2: 11:30am-1pm

Construction of a TA vector for rapid detection of Salmonella monocultures using mutant p22 bacteriophages

Author(s):

Pritham Sambathur† (Science, Honors)

Abstract:

Bacteriophages are the most abundant form of “life” on Earth, with billions preying on different bacteria with various levels of specificity from genus to strain. Their specificity can be exploited to create a robust and low-cost method for the detection of foodborne pathogens by integrating reporter genes into their genomes. In this work, the temperate Salmonella phage, p22, was used to screen a library of Salmonella isolates that were previously isolated and deemed problematic by the USDA/FSIS. Using standard plaque assays, these isolates were screened for p22 susceptibility with the use of phage titers that allow for simple visualization of infection. Higher phage titers were also used to isolate any potential p22 mutants that may be present as well. In parallel, a mutant p22 phage containing an amber mutation in the lysin gene and a vector, containing a wild type p22 lysin gene, were used to insert a nanoluc reporter gene into p22 by recombination. This approach is desirable because the restoration of the lytic phenotype is coupled with insertion of the reporter gene and removes the requirement for co-insertion of an antibiotic resistance marker. The recombinant p22 nanoluc reporter phage now serves as a reliable and economical detection methodology compared to costlier PCR analysis. The rapid detection of pathogens with high fidelity and low cost will allow increased surveillance and identify contamination risks from farm to fork.

Mentor(s):

Bruce Applegate (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 402
Presentation Time: Session 2: 11:30am-1pm

Currency Detection using Image Processing Techniques

Author(s):

Katherine Sandys† (Engineering); Joseph Lin† (Engineering); Leng Lohanakakul† (Engineering)

Abstract:

The purpose of this project is to build an app for users to be able to take pictures of Columbian, Thai, Hong Kong or UAE paper bills and the app should be able to differentiate the four and extract key information about the bill. Currency can be differentiated by the writing or symbols present on the bill. The application has three parts: an android app for front end UI (user interface), a back end for image processing using Python script, and a server that interacts with both the back end and the app. To achieve our project goals, we will use several image processing techniques to preprocess the image, segment the image into meaningful regions, and extract and process features within these regions. The final product is an Android application that allows the user to take an image of a bill and display the country, denomination, and conversion to USD of the currency back to the user.

Mentor(s):

Edward Delp (Engineering); Carla Zoltowski (Engineering)

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Poster Presentation Abstract Number: 403
Presentation Time: Session 2: 11:30am-1pm

Cross-Dataset Evaluation for Robust Human Detection

Author(s):

Robert Sego† (Engineering); Xilai Dai† (Engineering); Alex Weber† (Engineering); Patrick Li† (Engineering); Sun Ahn† (Science); Wenjing Chen† (Engineering)

Abstract:

The purpose of this project is to create a broader human detection model capable of finding people in a variety of contexts. The end model must detect humans in unusual poses, obscured partially by the scenery, distorted by fast movement, or surrounded by a crowd. To meet these constraints we implemented YOLO, a general object detection neural network, and trained it on three datasets with unique properties, ETH, WIDER 2019 Pedestrians, and Eurocity Persons. By using cross-dataset evaluation, we can identify what model properties and what dataset properties produce greater generalizability.

Traditional pedestrian detection models often perform poorly on datasets beyond their training data due to their specialized structure, and their source datasets rely on a uniform image angle and often do not contain crowds, resulting in a lack of input diversity. By using a more general architecture for human detection and a web-scraped or varied datasets, we are working to create a more robust detector that is effective on a wider range of datasets than contemporary models for pedestrian detection, such as F2Dnet, EGCL, and Pedestron. Our final analysis will compare the trained YOLO detector against these pedestrian detectors on street view, surveillance, and crowd images.

The resulting human detection model will be an effective research tool for various human-related observational tasks such as intention estimation, crowd counting, and subject identification. Furthermore, it has the potential to inform future designs for pedestrian detectors.

Mentor(s):

Carla Zoltowski (Engineering); Edward Delp (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 404
Presentation Time: Session 2: 11:30am-1pm

Community Perspectives on Community Health Worker-facilitated HPV Self-sampling for Cervical Cancer Screening in Lake County, Indiana

Author(s):

Sathveka Sembian† (Engineering); Alyssa Arreola† (Science)

Abstract:

Cervical cancer screening disparities exist between African American, Hispanic, and Asian women as compared to White women in Indiana. Specifically, Lake County, which has the largest Hispanic population in the state, has some of the highest incidence and mortality rates for cervical cancer in Hispanic women. Although there has been progress in reducing cervical cancer prevalence through screening and HPV vaccination, they have not completely resolved disparities in minority communities. To improve equity and access to screening, the President's Cancer Panel recommends HPV self-sampling and engaging community health workers (CHWs), who can connect health services with communities in culturally appropriate ways. However, few studies explore CHWs and community members' perspectives on the feasibility and acceptability of these approaches. To address this gap in literature, in-depth interviews were conducted with 15 CHWs and 9 community members from Lake County, Indiana and neighboring areas to understand barriers to cervical cancer screening and how screening innovations, such as HPV self-sampling, can address those barriers with support from CHWs. A thematic analysis revealed that community members echoed many sentiments that CHWs expressed regarding the feasibility and acceptability of a CHW-led intervention. For instance, both voices identified comfort and ease of transportation as major facilitators for acceptability with lack of trust and lack of physical space identified as barriers. Differences in their perspectives included perceived self-efficacy, time limitations, and concerns about novelty of the method. Both perspectives endorsed that a CHW-led approach to HPV self-sampling shows promise of improving screening rates and cervical cancer incidence.

Mentor(s):

Natalia Rodriguez (HHS); Lara Balian (HHS); Tiwalade Adekunle (Liberal Arts); Layla Claure (HHS)

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Poster Presentation Abstract Number: 405

Presentation Time: Session 2: 11:30am-1pm

PUID: Path-planning for UAV Inspection through Demonstration

Author(s):

Revanth Krishna Senthilkumaran† (Engineering, Honors)

Abstract:

Unmanned Aerial Vehicles have been used increasingly in many applications for inspecting large structures like buildings and airplanes. In the real world, an expert flies the UAV around the structure and inspects it. However, it is expensive to hire a task expert and automating such a task is challenging. A novel framework, PUID, Path-planning for UAV Inspection through Demonstration is introduced to learn to inspect an object from an expert demonstration and generalize it for similar objects. Objects of similar type, but different shapes and dimensions, like different airplane models, are considered. First, based on their geometry, correspondences that map similar regions between them are computed using Iterative Closest Point matching. Then, the expert demonstrates an inspection trajectory on one of the objects. Now the goal is to generate a new trajectory for a similar object that closely replicates the inspection from the demonstration. Based on the regions covered by the trajectory on the demonstrated model and their corresponding regions in the target model, inspection viewpoints are computed, enabling viewing of similar regions in the target model. A Levenberg-Marquardt optimizer is then used to refine the inspection viewpoints to generate a new trajectory. Through experiments, it was found that the trajectory generated from the demonstration viewed similar regions from the model, and the geometry of the trajectory generated was close to the geometry of the expert-generated path. Based on Frechet distance, the trajectories were found to be similar in shape, irrespective of scale differences.

Mentor(s):

Byung-Cheol Min (Polytechnic Institute); Shyam Sundar Kannan (Polytechnic Institute); Vishnunadan Venkatesh (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 406
Presentation Time: Session 2: 11:30am-1pm

Simulation to Visualization of Distributed Energy Sources

Author(s):

Jeff Shao† (Engineering); Emily Tonkovich† (Engineering); Jinkai Liu† (Engineering); Ryan Ford† (Engineering); Alexandria Montoya† (Engineering); Anna Rosha† (Engineering)

Abstract:

As the world demands for energy increase, the grid must become adaptive. Mitigating against disruptive events, such as blackouts, is a key challenge in designing a smarter grid. Proper grid visualization software and simulation tools play important roles in reducing the impact of these events by providing operators with clear information to make quick decisions concerning the grid's status. Currently, our team is working on integrating a simulation tool and visualization tool to better visualize sections of a grid delivering power to different loads. Our project uses data generated from GRIDLAB-D, an open source power system simulation software used to simulate and evaluate the performance of power systems under different conditions such as demand, renewable energy, and load output. Because of its customizability, this will be used to develop and simulate new control strategies and energy management for various distributed energy sources (DERs). The visualization tool creates a simplified visual for electric distribution feeders and uses a graphic user interface (GUI) consisting of interactable grid components that can be selected for editing and a zoom-in function. The visualization tool uses output files of GRIDLAB-D simulations to input data such as electrical energy values from loads at certain dates and time intervals. Based on these models, the visualization tool allows the user to see voltage and current values over time at specific nodes. It also allows users to choose to deactivate portions of the system as changes in the grid occur and outputs a new file corresponding to these grid changes. The integration of GRIDLAB-D simulations and the visualization tool will enable real-time data integration and visualization. This will allow operators to observe the grid better, make quicker decisions, and relay information to electric companies and field workers. The software will eventually be available via a mobile app, allowing users to access and modify grid information remotely.

Mentor(s):

Dionysios Aliprantis (Engineering); Loraine Navarro (Engineering); Dakota Hamilton (Engineering)

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Poster Presentation Abstract Number: 407
Presentation Time: Session 2: 11:30am-1pm

Three-Dimensional Ultrasound Imaging and Geometric Changes of the Murine Cervix during Gestation and Post-partum

Author(s):

Arden Shen† (Engineering)

Abstract:

Essential for pregnancy and delivery, the cervix connects the uterus to the vagina forming the birth canal and during pregnancy the cervix remodels in four overlapping stages: softening, ripening, dilation, and repair. However, specifics of these remodeling stages including the timeline in which they occur and how they are altered in the pathologic conditions of pregnancy is largely understudied. This work aims to better identify the onset and cessation of each of the four stages in lactating and non-lactating mice.

C57Bl/6J virgin female mice (n=2) were paired with C57Bl/6J male mice in a 2:1 breeding scheme. Three-dimensional (3D) cervical ultrasound images were taken at gestational days (e) 6.5, 12.5, 15.5, and 18.5 and post-partum days (PD) 1, 4, 7, 14, and 21. Dams were randomly placed in either the lactating (n=1) or non-lactating (n=1) group. Dams in the non-lactating group had their litter separated and sacrificed within 24 hours after delivery; while those in the lactating group had their pups weaned on post-partum day (PD) 21. The 3D images were analyzed for cervical length and cross-sectional area.

The preliminary results show cervical shortening (average difference e0 to e18.5: 3.49 ± 2.10 mm decrease) during gestation and lengthening immediately post-partum (average difference e18.5 to PD1: 4.85 ± 0.06 mm increase) consistent with current descriptions of the cervical remodeling process. Both lactating and non-lactating mice cervix lengths appear continually decrease during the investigated 21 days post-partum. Following analysis of all timepoints, identification of remodeling stages may reveal potential consequences on cervical function.

Mentor(s):

Craig Goergen (Engineering); Jennifer Anderson (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 408
Presentation Time: Session 2: 11:30am-1pm

Gender and Perceived Motivation: Understanding Gender Differences in Receiving Requests for Extra-Role (Low Promotability) Service Work

Author(s):

Emma Showalter† (HHS, Honors)

Abstract:

Gender inequality within the workplace continues to be a topic of interest for many researchers, yet the underlying mechanisms, specifically regarding requests for extra-role service work, are not well understood. Service work are tasks that employees do, which are not part of their formal job requirements but help the organization as a whole. Integrating recent research that suggests attributions of passion can lead to poor worker treatment (Kim et al., 2020) and women may be asked to volunteer more than men (Babcock et al., 2017), we hypothesized that women will be seen as more intrinsically motivated to do service work, seen as being asked to do more service work in general, and seen as being asked to do more service work that has low promotability within an organization. We investigated this by collecting data from 311 workers. They were asked to identify their perceptions about men and women's motivation to do service work and respond to measures about the frequency and quantity of the service work that men and women are asked to do. Additionally, the participants were asked to rate the promotability of the service work that they believe men and women are asked to do. Results supported our hypotheses and found that women are seen as more intrinsically motivated to do service work than men, women are seen as being asked to do more service work (both frequency and quantity), and women’s service work was rated as having lower promotability.

Mentor(s):

Franki Kung (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 409
Presentation Time: Session 2: 11:30am-1pm

Cut mark cleaning and analysis

Author(s):

William Shumway† (Liberal Arts)

Abstract:

Throughout the last semester, the focus of my research has been on cut marks. The reason for this direction of study is because while there are multiple sites where projectile points have been found in association with various animals, very few can definitely prove the purpose behind the use of those points. By analyzing copious amounts of marks found at different sites and comparing them to the marks made in the lab during tests, the intention behind the fossil marks may be found. The majority of my work has been done on cut marks scanned from both the Mud Lake site as well as tests done in the lab. These tests have consisted of scoring bone, making molds of the cut surface, and then scanning both the bone and the mold. This serves two purposes, the recording of the cut surface, and the testing of the mold material in its ability to accurately reproduce the surface. By continuing this process and even expanding to the study of cut marks made on frozen bone, a better understanding of what causes different cut mark shapes to be made will be achieved.

Mentor(s):

Erik Otarola-Castillo (Liberal Arts); Trevor Keevil (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 410
Presentation Time: Session 2: 11:30am-1pm

Plasmonic nanoparticle densities for physical verification of unclonable spectral tags in microelectronics packaging

Author(s):

Daksh Kumar Singh† (Engineering, Honors)

Abstract:

In recent decades, the growth of the semiconductor and microelectronics infrastructure has emphasized the need for improved security measures and verification techniques throughout the fabrication and handling process. In this work, we investigate the effectiveness of plasmonic verification methods using randomly spread gold nanoparticles on the surface of the microelectronic device packaging. These nanoparticles act as a covert tag, creating a unique “fingerprint” that cannot be replicated. We employ two primary methods of embedding these particles: Drop Casting (DC) and Spin Coating (SC) and characterize the samples using Variable Angle Spectroscopic Ellipsometry (VASE). In addition, we compare the variance in spectra for varying concentration of nanoparticles to determine the optimal density and particle placement ratios for secure verification. Our findings show that the intensity of the second peak of the spectra is correlated with the particle density in both coating methods and changes wavelengths with change in nanoparticle concentration. This suggests that gold nanoparticles offer random and unique spectral tags for verification of microelectronics. We see further development in future works via machine learning for the development of robust verification frameworks based on plasmonic spectral tags.

Mentor(s):

Alexandra Boltasseva (Engineering); Blake Wilson (Engineering); Yuheng Chen (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 411
Presentation Time: Session 2: 11:30am-1pm

Neural Network Approaches to XENONnT Data Analysis

Author(s):

Gurmehar Singh† (Science); David Bondar‡ (Science); Atharva Awasthi‡ (Science); Nathan Benton‡ (Science, Honors)

Abstract:

In this paper, we rethink XENONnT's nuclear recoil and electronic recoil (NR & ER) event discrimination, prior performed with reduced, pre-processed data. We utilize simulation-generated waveform data. Given how data-heavy this task is, the use of neural networks present an opportunity to better define the boundary between the two events. We present both standard dense neural network models as well as multiple-input models to achieve this discrimination, as well as a multiple-input model to reconstruct the position of events from per-PMT data. To discriminate between ER and NR, we treat summed waveforms as 1-dimensional arrays and arrange per-PMT data into 2-dimensional arrays that we refer to as super-images, which contain data from S1 events, S2 events, and an encoded drift time. For position reconstruction, our network contains input layers for each PMT waveform, which are later concatenated and produce a 3-vector output – the position. We examine the benefits of various models in comparison to each other as well as compare their performance to models that worked with the reduced, pre-processed data.

Mentor(s):

Rafael Lang (Science); Shengchao Li (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 412
Presentation Time: Session 2: 11:30am-1pm

Lake Michigan Shoreline Landowner Survey

Author(s):

Colby Smock† (Agriculture)

Abstract:

My research has involved developing a survey to understand perspectives of homeowners along the Indiana Lake Michigan Shoreline based off the rapidly changing conditions they have observed in their recent history. The Indiana Shoreline has undergone extreme stress due to water level fluctuations over the past ten years. From near record lows in 2013, to record highs in 2020, the rapidly changing water levels have caused severe erosion of beaches and foredune area. This has put the communities along this shoreline in a dire spot as they risk losing their beaches and homes along the lakeshore. The survey I am working on will help these communities understand how to move forward with planning and kickstart a process of informed decision making with their shoreline management. Based on a comprehensive review of community plans and ordinances, many of these communities have little to no plan for how to move forward with addressing the management of their shoreline. This will significantly alter their ability to fund future management advancements. My research to this point has assessed the current conditions of the Indiana Shoreline and what plans are in place to deal with it. The final research question, how do the landowners along the Indiana shoreline perceive the situation at hand, has still yet to be answered. The data from the survey will be coming soon. Once we get it, we will begin to perform data analysis and determine what it is that these communities want and need.

Mentor(s):

Aaron Thompson (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 413
Presentation Time: Session 2: 11:30am-1pm

Result of cooling heat stressed sows and Moringa oleifera supplementation on milk composition

Author(s):

Evy Tobolski† (Agriculture)

Abstract:

Heat stress causes oxidative stress and decreased milk production in swine. Moringa oleifera is high in antioxidants and fiber, which may counteract oxidative damage. A 2X2 factorial study was conducted to determine the effect of 4% moringa supplementation and conductive cooling on milk composition and litter growth of heat stressed sows. We hypothesized that cooling and Moringa supplementation would increase protein and fat percentage in milk. Sows, blocked by back fat and parity, were assigned to 1 of 4 treatments: cooling (C; n=12), heat stressed (HS; n=12), HS + Moringa (M; n=12), C + M (n=12). At 100 days of pregnancy, sows moved to farrowing crates fed control or control + 4% Moringa diets. At 110 days of gestation, sows were fed a lactation diet and rooms were heated to 33°C. Colostrum (d0) was collected 3 h after the initiation of farrowing. Milk on d3 and d14 were collected after the administration of oxytocin. Creamatocrit and Bicinchoninic Acid assays measured percent fat and protein. Mixed model analysis determined that litter growth was not affected by treatment. There was a tendency for a diet (P = 0.07) and day (P = 0.04) effect on milk fat but no effect of cooling. There was an effect of day (P < 0.0001) on protein percentage and an interaction between cooling and diet (P = 0.0013) on d14 protein. Thus, Moringa increased milk fat content across all days and milk protein on d14, which was not related to litter growth.

Mentor(s):

Theresa Casey (Agriculture); Radiah Minor (North Carolina A&T University); Allan Schinckel (Agriculture); Wonders Ogundare (North Carolina A&T University); Linda Beckett (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 414
Presentation Time: Session 2: 11:30am-1pm

Returning to Campus During the COVID-19 Pandemic with a Concealable Chronic Illness: Social and Health Challenges

Author(s):

Lauren Todd† (HHS); Emily Staub† (Science)

Abstract:

College is a time for building friendships and relationships, trying new things, and developing a sense of community. The COVID-19 pandemic has made it hard for students to fully experience college, especially for individuals with chronic illnesses with increased health risks. Many illnesses are concealable, meaning their symptoms can be hidden. In this study, we examined experiences of students with concealable chronic illnesses as they returned to campus during the pandemic. We examined students' concerns about contracting COVID, health behaviors, and fit and social isolation on campus, including relationships with romantic partners. Students who felt more concerned about COVID felt more socially isolated. Students in relationships were more concerned about themselves and their loved ones contracting COVID than those not in relationships. Those in more satisfying relationships engaged in fewer risky behaviors and felt less socially isolated than those in less satisfying relationships. This study showed the social and health challenges associated with returning to campus during the pandemic yet identified relationships as important resources to help them navigate this transition.

Mentor(s):

M. Rosie Shrout (HHS); Emily M. Buehler (Liberal Arts); Daeun Grace Lee (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 415
Presentation Time: Session 2: 11:30am-1pm

Analysis of Blood Vessel Functionality and Correlation to Stem Cell Biomarkers Measured by Dynamic Contrast Enhanced-Computed Tomography

Author(s):

Austin Trebley† (HHS, Honors); Hannah Rodgers‡ (HHS); Annabelle Hoffert‡ (HHS); Lucas Bottini‡ (HHS); Nicole Stepp‡ (HHS); Mackenzi Rivera‡ (HHS)

Abstract:

Purpose: The purpose of this study to utilize dynamic contrast-enhanced CT (DCE-CT) imaging and immunohistochemistry (IHC) to quantify microenvironments based on the functionality of the vasculature and conclude if cancer therapies affect the tumor and normal tissues.

Methods: The first part of the study investigates if DCE-CT can differentiate vasculature among triple-negative breast tumors (SUM149, HCC1143, MDA-MB-231) in athymic mice and if the microenvironment correlates with cancer stem cell biomarkers (EpCAM, ALDH1A1, DLL1). The second component of this research treated mice with SUM149 tumors with varying doses of DC-101 (10, 40, 120 mg/kg; i.p.). DCE-CT quantified vasculature parameters and IHC the biomarker expression in these tumors. Additionally, DCE-CT was used to evaluate the systemic effects in the lung and liver.

Results: The results for the first part indicate that microenvironments within different tumor types can be differentiated using DCE-CT. When compared to IHC, a significant correlation between the vascular flow parameters and biomarkers was observed. In the second part of the study, the vasculature microenvironment changed depending on the dose of DC-101, insignificant changes with low doses and large vasculature ablation with high doses. Changes in the lung and liver varied with dose and between tissues.

Conclusion: DCE-CT differentiated between tumor types and correlated with some of the cancer stem cell biomarkers. In SUM149, DCE-CT was able to observe a dose dependent change in the vascular physiology, a guide to evaluating hypoxia. Post-therapy values could lead to valuable results to understand the DC-101 effects of tumor and normal tissue microenvironments.

Mentor(s):

Keith Stantz (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 416
Presentation Time: Session 2: 11:30am-1pm

Forensic Toxicology: A Miniseries

Author(s):

Claire Tulloch† (HHS, Liberal Arts, Honors)

Abstract:

This presentation will include 3 projects I completed in the ADDL toxicology laboratory. The first project was to develop and validate a method for anticoagulant rodenticide testing in blood and plasma using HPLC/UV/F. Anticoagulant rodenticides are of concern in human and veterinary medicine because they can affect non-target species and have also been found as adulterants in street drugs. The severe blood loss they cause could lead to a list of health problems, including death. Whether it be malicious or accidental, there have been many times when non-target species were harmed or killed from rat poisons. The method we used is now incorporated into standard operating procedure in the ADDL and is offered to clients. The second project was to quantify vitamin A in bovine liver and plasma using HPLC/F. The purpose of this project was to make a diagnostic test for perinatal death in cattle, since vitamin A deficiency affects their health and reproductive performance. Upon successfully developing and validating the method, the ADDL plans to incorporate this test in SOP and use it as a diagnostic test. We are currently completing an additional methods development project which involves developing a quick test for amanitin toxins in canine liver. These toxins cause severe liver damage and cases have been reported that affect small animals, such as dogs, and unintentional poisoning in humans. A common goal in each project was to develop new diagnostics test and to determine the lowest detection level for the toxicants investigated.

Mentor(s):

Christina Wilson-Frank (Veterinary Medicine)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 417
Presentation Time: Session 2: 11:30am-1pm

Predicting User Viewport in 3D Video With Regression Models

Author(s):

Anjali Vanamala† (Engineering, Honors)

Abstract:

360 video streaming allows users to watch a video in any direction, enabling an interactive and immersive experience for the users. However, 360 video streaming requires high bandwidth (up to 6x of traditional video streaming) to stream the full 360 video frame, of which only a part is viewed by the user at any point in time. Recent streaming approaches predict the user movement and transmit only the portion of the video frame watched by the user. These approaches spatially divide the video frame into tiles, predict a user's viewport, and stream the viewport tiles at a high quality and stream the remaining tiles of the frame at a lower quality. If the viewport tiles required by a user are not available during the streaming, either due to incorrect prediction or poor network, the streaming is stalled and leads to a poor quality experience for the user.

Our research focuses on improving the user movement prediction to correctly predict the tiles required for the viewport and subsequently the non-viewport tiles. We use available 360 video user movement datasets and evaluate different regression models: Linear, Support Vector, Ridge, etc. We observe (i) Linear regression can achieve similar if not better performance than other regression models, (ii) The accuracy of the models is dependent on the prediction window, with accuracy close to 90% for short prediction windows and less than 60% for long prediction windows. Our next steps involve using sophisticated time series prediction models such as LSTM to improve the accuracy.

Mentor(s):

Sanjay Rao (Engineering); Chandan Bothra (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 418
Presentation Time: Session 2: 11:30am-1pm

Evaluating Who Preschoolers are Active with and the Role of Home Chaos in Their Physical Activity Engagement

Author(s):

Cayla Woten† (HHS, Honors)

Abstract:

This study examined who children engaged in physical activity with at home (e.g., alone, relatives, and peers) and whether the amount of chaos in the home was related to the amount of physical activity children engage in with their family members. Research on families' engagement in physical activity with their children has been primarily focused on parents. However, the home setting encompasses other prominent members, such as siblings, grandparents, and peers, which may aid in supporting children's engagement in physical activity. Also, home chaos (i.e., noise, overcrowding, and a lack of structure, routines, and predictability in the home setting; Evans et al., 2021), may inhibit the amount of time families are able to engage in shared activities. Parents of 73 children aged 4-to-5 years old (M=5.11, SD=0.32) completed a survey that asked how often (minutes a week) and who children engaged in physical activity with at home (adapted from Becker et al., 2018) and the Confusion, Hubbub, and Order Scale (CHAOS; Matheny et al., 1995). First, descriptive analyses will be conducted in which we examine the proportion of children that engaged in physical activity by themselves, with relatives (e.g., parents, siblings, grandparents), or with their peers. Second, multiple regression analyses will be conducted to investigate whether chaos in the home predicts children's time spent being physically active. Findings from this study will be presented at the conference and are important for broadening our understanding regarding contextual factors that play a role in children's engagement in physical activity.

Mentor(s):

David Purpura (HHS); Lauren Westerberg (HHS); Lindsey Bryant (Mathematica); Sara A. Schmitt (University of Oregon); Robert J. Duncan (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 419
Presentation Time: Session 2: 11:30am-1pm

RISCV Digital Verification

Author(s):

Troy Wu† (Engineering); Yi-Fang Hsiung‡ (Engineering)

Abstract:

ASIC chips are highly complicated, so the chance of having a flaw in the chip design is very high. Any undetected error in the pre-silicon stage, may cause undesirable behavior and very costly to fix after manufacturing. Therefore, ensuring the ASIC is bug-free in the pre-silicon stage is extremely important.

The project's end goal is to implement a UVM-based verification test plan for the in-house RSIC-V processor.

Mentor(s):

Mark Johnson Johnson (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 420
Presentation Time: Session 2: 11:30am-1pm

De novo design of a protein inhibitor targeting SARS-CoV-2 using Foldit

Author(s):

Zilin Xianyu† (Pharmacy, Honors)

Abstract:

SARS-CoV-2 infects humans through its binding with the angiotensin-converting enzyme 2 (ACE2) receptor on cell surfaces. Small molecule proteins that target the SARS-CoV-2 receptor binding domain (RBD), part of the viral spike protein that directly interacts with ACE2, can block the binding of the virus, and thus prevent it from entering human cells. Compared to automated protein design methods, the combination of artificial intelligence algorithms and humans' unique problem-solving skills in the citizen science game Foldit has been shown to generate accurately designed protein structures. Hence, Foldit was used in this study to design a small binder protein that binds with the SARS-CoV-2 RBD with a high affinity and stability. The binding strength and stability of the design was measured using Rosetta energy units, contact surface area, unsatisfied polar atoms quantification, and binding energy (delta delta G).

Mentor(s):

Zahra Tehrani (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 421
Presentation Time: Session 2: 11:30am-1pm

Complexity of P4-free Partition and Cover Numbers

Author(s):

Daniel Xie† (Science, Honors)

Abstract:

Graph covering problems, which ask how much of a certain type of graph one needs to "recreate" an arbitrary graph, have been of great interest in theoretical computer science due to their appearances as natural representations of numerous, potentially unrelated problems. This work-in-progress report will continue in this spirit; our "certain type" of graph shall be P4-free graphs, and we will consider how many are necessary to cover the edges of bipartite graphs. This specific covering problem is known to appear as a representation of select problems in information-theoretic cryptography, communication complexity, and scheduling.

It has been previously shown that deciding whether a bipartite graph has P4-free cover or partition number less than or equal to 2 is NP-complete; our first aim is to investigate if we can generalize this result to any number greater than 2. Since the decision problem is hard even for k=2, it is unlikely that there is an efficient algorithm that computes P4-free cover/partition numbers exactly, so we will also seek to find efficient approximation algorithms or prove the hardness of approximating these numbers. We will also attempt to analyze a "smoothed" version of the problem, that is, given a graph with a certain P4-free cover/partition numbers, how drastically can the numbers change if we permit an adversary to make a small number of modifications to the graph?

Mentor(s):

Hemanta Maji (Science); Jimmy Hwang (Science); Xiuyu Ye (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 422

Presentation Time: Session 2: 11:30am-1pm

Manufacturing Methods of Thin Films for TENG Devices

Author(s):

Jacob Zendejas† (Engineering); Conor McCarthy‡ (Engineering); Meghan Gron‡ (Engineering); Saichandana Pothireddy‡ (Engineering); Hongyi Shen‡ (Engineering); Justin Lesinski‡ (Engineering); Blake Iftiger‡ (Engineering)

Abstract:

Triboelectric Nanogenerators (TENGs) are self-powering generators that offer a unique approach to renewable energy for smart wearable devices [1]. Researchers are exploring various types of materials used to manufacture TENGs and with different materials comes with different manufacturing methods. Three methods will be discussed which can be categorized based on the material properties they handle, namely ink-based, solution-gel, and powder-based materials. Ink-based methods incorporate 2D-printing techniques of highly viscous materials on top of a substrate. Currently in academia, examples of this method that are of interest include Direct Ink Writing, Screen Printing, and Aerosol Jet Printing [2]. This method is significant since it utilizes known technology and techniques allowing for easier manufacturing of TENGs [2]. Solution-gel methods involve chemical vapor deposition (CVD), a process resulting in thin film deposits that react or break down on the surface of the substrate due to vigorous movements [3]. Spin coating is one example that demonstrates manufacturing using a solution-gel, where the sol-gel is placed on a plate that rotates rapidly, resulting in an evenly distributed layer. Solution-gel methods are particularly important due to their already extensive use in industry to produce other microelectronics and their efficiency in producing consistent thin films [4]. Powder-based methods utilize an FDM-based 3D-printing strategy, making manufacturability effective since it uses existing technology [5]. Powder-based methods have shown the ability in producing TENGs with improved electric performance [5]. The extensive research in manufacturing methods for TENGs are crucial to the future of its efficiency and scalability as a device.

Mentor(s):

Wenzhuo Wu (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 423
Presentation Time: Session 2: 11:30am-1pm

Motor and somatosensory cortex coupling during active touch

Author(s):

Jason Zuniga† (Science)

Abstract:

Accurate animal behavior and perception requires a precise coupling between motor cortex and sensory cortices. The mouse whisker system is an attractive model to study the circuit mechanisms underlying communication between motor and somatosensory cortex. In this system, discrete “barrels” in somatosensory cortex correspond to specific whiskers on the animal face. Therefore, we can precisely stimulate single whiskers and know exactly where to perform electrophysiological recordings to record how the brain perceives these touch stimuli. Moreover, we can also target and record from the cortical region in motor cortex responsible for driving animal whisking. By using a device called a NeuroTar, the mice are able to move freely on a floating cage while still assessing their surroundings. When taking readings of activity in the motor cortex (M1), we can find activity that may be linked to the barrel cortex (S1) that is tied to processing stimuli. Specifically, we test the role of subcellular traveling waves in M1 and the influence that they may have on S1 activity. Through previous work, we have established that M1 feedback drives traveling waves of dendritic activity in S1 following passive whisker stimulation. In this new behavioral paradigm, we test whether these dendritic feedback waves also exist as animals actively scan their environment with whiskers. These experiments will reveal the fundamental circuits underlying multi-region communication in the brain during sensorimotor behaviors, providing a path for studying neurological disorders that disrupt locomotion or block the precise communication between brain areas.

Mentor(s):

Krishna Jayant (Engineering); Daniel Gonzales (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 500
Presentation Time: Session 3: 2pm-3:30pm

Analysing the properties of different materials by mapping their structures.

Author(s):

Mayank Agarwal† (Engineering); Qiancheng Sun‡ (Honors)

Abstract:

Rapid strides are being made in the field of piezo electricity; however, further research is required to understand properties of the different materials and their conductive properties. The conductive property of a substance is influenced by various factors, with the structure of its monolayers being one of them. This research focuses on analysing the different material; there properties and structures. Analysing the band structures of the different monolayers, it provides an idea about the conductivity of the material vis a vi piezo-electric coefficient. Making use of DFT calculations, to analyze the structure, a POSCAR file is made that contains the geometry of various structures. The angles between the various atoms and their vector computations are used to create the structures. Every structure requires a separate set of calculations and a different set of INCAR, SIGMA, ENCUT, and K-mesh. The results of the values are then used for the potential piezoelectricity calculations. Results obtained so far are indictive of the influence of twist angle on the conductive properties. The research is ongoing; however, it is evident that different material showcases relatively different properties and interact differently in relations to piezo electricity.

Mentor(s):

Tillmann Kubis (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 501
Presentation Time: Session 3: 2pm-3:30pm

Novel Protein Design of a SARS-CoV-2 Inhibitor

Author(s):

Alyssa Altman† (Engineering, Honors)

Abstract:

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infects human cells when the viral spike protein receptor binding domain (RBD) binds to the angiotensin-converting enzyme 2 (ACE2) receptor of human cells. This leads to a conformational change in the virus that allows for membrane fusion between the virus and the cell. RBD- ACE2 interaction can be prevented by using a small binding protein that competes with ACE2 by binding to the RBD. Small binding proteins are not only more stable and cheaper to manufacture than traditional antibody-based therapeutics, but they can be designed to be administered through a nasal application taken immediately after virus exposure to prevent infection. Foldit, a citizen science game, will be used to design a small binding protein against the spike RBD of SARS-CoV-2. Due to the inherent complexity surrounding protein design, current automated methods such as Rosetta struggle to design unique protein structures compared to a human-computer hybrid approach seen in programs such as Foldit. The stability of the designed small binding protein will be evaluated using Rosetta energy units provided by Foldit which directly correlates to the protein's energy state. Additionally, three metrics, $\Delta\Delta G$, buried unsatisfied polar atoms, and the surface area of the binding interface will be used to assess the binding affinity between the designed protein structure and the spike RBD. The resulting small binding protein from this study will provide Foldit's creators with a candidate protein structure for synthesis and experimental testing.

Mentor(s):

Zahra Tehrani (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 502

Presentation Time: Session 3: 2pm-3:30pm

Vaginal Temperatures of Heat Tolerant and Non-Heat Tolerant Lactating Sows Under Heat Stress Conditions

Author(s):

Sai Ambaty† (Agriculture, Honors)

Abstract:

Thermal stress negatively affects the welfare, production, and reproduction of lactating sows. The objective of the study was to validate the genomic selection for heat tolerance using phenotypic data of genomically-selected heat tolerant (HT) and non-heat tolerant (NHT) sows under heat stress conditions based on vaginal body temperatures to develop a method to mitigate the effects of heat stress on lactating sows. During the study, multiparous sows (n=27; parity =4.81, SD=0.74) were selected for being NHT (n=11) or HT (n=16) based on their vaginal temperature recorded in a previous experiment. On day 2.54, SD=1.00 post-farrowing, sows were exposed to cyclic heat stress (28-32C). All sows were measured with a vaginal temperature monitoring device three days post-farrowing and vaginal temperature was recorded every 10 minutes. Each sow had a temperature monitoring device in its crate to record the room temperature (RT), relative humidity (RH), and dew point (DP) every 5 minutes. The averages (SD) for RT, RH, and DP during the experiment were 85.53 (2.14), 48.56 (14.08) and 62.90 (11.52). The average (SD) vaginal temperatures for lactating NTN sows ranged from 38.93 (0.78) to 40.62 (0.23), with an overall average of 39.60 (0.87) for this treatment. For HT lactating sows, the average (SD) vaginal temperatures ranged between 38.67 (0.18) to 40.35 (0.31), averaging 39.7 (0.92). A similar visual impact was observed between HT and NHT. Small sample size, measuring phenotypic scale, and only one generation could be reasons for the similarity for values between HT and NHT.

Mentor(s):

Luiz Brito (Agriculture); Jay Johnson (U.S. Department of Agriculture); MaryKate Byrd (Agriculture); Andre Araujo (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 503
Presentation Time: Session 3: 2pm-3:30pm

Association Between Maternal Anxiety in Toddlerhood and Child Anxiety in School-Entry Age Children Among Neurogenetic Syndrome Population and Typically Developing Children

Author(s):

Faith Anthony† (HHS)

Abstract:

Studies have shown that children with anxiety experience higher rates of adverse child outcomes (O'Connor et al., 2002, 2003), and the presence of maternal anxiety within the first years of life is correlated with higher levels of anxiety and behavioral issues later in life (Glasheen et al., 2010). However, it is unclear how child and maternal anxiety are related in children with neurogenetic syndromes (NGS). This study examines the association between maternal anxiety during toddlerhood and child anxiety at school-entry age. I hypothesized higher maternal anxiety during toddlerhood would be associated with higher anxiety at school-entry age in children with NGS when compared to TD children. Data was taken from 116 families in the Purdue Early Phenotype Study, a longitudinal study interested in development of children with NGS and parents' experiences. Children were TD (n=39) or had a NGS including fragile X syndrome (n=5), Down syndrome (n=3), Prager-Willi syndrome (n=20), Williams syndrome (n=23). Families were assessed when their child was between 18 months and 35 months and within 36 months and 70 months. The Depression, Anxiety, and Stress Scale and the Child Behavior Checklist were utilized to measure anxiety. Planned analyses will use partial Pearson's Correlation to test associations between maternal and child anxiety. I expect that there will be a statistically significant correlation between maternal and child anxiety, and that early maternal features will predict later child outcomes, controlling for child baseline features. Results of the study may aid in early prevention and better treatment of child anxiety among NGS populations.

Mentor(s):

Bridgette Kelleher (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 504
Presentation Time: Session 3: 2pm-3:30pm

Probing the HYPE-BiP interaction, a critical regulator of ER stress

Author(s):

Anushree Ari† (Science); Ethan Forbes* (Science); Sandra Warne* (Science); Elisabeth Kohl* (Science)

Abstract:

Fic (filamentation induced by cAMP) proteins post-translationally modify their protein targets, predominantly by a process called AMPylation/adenylylation. AMPylation entails the breakdown of ATP to add an AMP (adenosine monophosphate) to the target protein. Our lab discovered that HYPE, the sole human Fic protein, is a novel regulator of the unfolded protein response (UPR) that maintains homeostasis in the endoplasmic reticulum (ER) in response to stress from misfolded proteins. HYPE regulates UPR by AMPylating the ER resident chaperone BiP, which binds and refolds misfolded proteins. Disruption of protein folding is closely linked to several diseases; our lab found a direct role for HYPE in protein misfolding during neurodegeneration like Parkinson's Disease. We also showed that the HYPE-BiP interaction serves as a nexus for therapeutics. Thus, understanding the kinetic and structural parameters that govern the HYPE-BiP interaction is critical for therapeutic drug design. These efforts, however, are hampered by the transient nature of the HYPE-BiP interaction. My project entails purification and biochemical characterization of wild type and mutant forms of HYPE and BiP proteins, alone and in complex with small molecule inhibitors, to promote stabilization of the HYPE-BiP complex. Data from this study provide useful insights for enabling structural determination of the HYPE-BiP complex and the first known therapeutic drug design for early stages of Parkinson's Disease.

Mentor(s):

Ben Watson (Science); Seema Mattoo (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 505
Presentation Time: Session 3: 2pm-3:30pm

Neuroprotective effects of the Nfe2L1 transcription factor in Parkinson's disease by proteasome upregulation

Author(s):

Brianna Arinze† (Pharmacy)

Abstract:

NFE2L1 (Nuclear factor erythroid-derived 2-related factor) is a CNC family basic leucine zipper transcription factor that plays a vital role in the maintaining neuronal homeostasis through transcriptional regulation of proteasome subunit and oxidative stress response genes. Parkinson's Disease (PD) is a neurodegenerative disorder that leads to a loss of dopaminergic neurons in the substantia nigra (SN) region of the midbrain. One of the common hallmarks of this disease is the presence of protein aggregates called Lewy bodies that are largely comprised of fibrillar forms of **α**-synuclein (aSyn), a presynaptic protein involved in the pathogenesis of PD. Post-mortem PD brains found reduced levels of NFE2L, which may lead to increased proteasome dysfunction and oxidative stress, which in turn causes a further increase in aSyn aggregates and PD pathogenesis. Therefore, strategies to enhance protein clearance and antioxidant responses have the potential to reduce aSyn aggregation and halt neurodegeneration. As such, we hypothesize that NFE2L1 alleviates aSyn-mediated nigrostriatal degeneration and aSyn aggregation by increased expression of genes involved with antioxidant responses and proteasome subunits and their assembly. In this study, we examine the effects of NFE2L1 on aSyn pathology using an in vivo model of PD with rats injected unilaterally in the SN with adeno-associated virus expressing the familial A53T aSyn mutant. The results of this study will yield insights into the protective effects of NFE2L1 by reducing aSyn-mediated neurotoxicity and PD pathology, setting the stage for the development of PD therapies that enhance NFE2L1 function in the brains of PD patients.

Mentor(s):

Chris Rochet (Pharmacy); Jennifer Hensel (Pharmacy); Benjamin Dehay (Univ. de Bordeaux, Inst. Des Maladies Neurodégénératives, Bordeaux, France); Erwan Bezard (Univ. de Bordeaux, Inst. Des Maladies Neurodégénératives, Bordeaux, France); Jason Cannon (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 506
Presentation Time: Session 3: 2pm-3:30pm

Next generation liquid metal based thermal interface materials

Author(s):

Tremael Arrington† (Engineering)

Abstract:

Nearly 60 years since its first proposal, Moore's law still holds in predicting the growth of complexity in integrated circuits. With increasing power density in microelectronics the need for better thermal management becomes more and more important. With these issues in mind, gallium and its alloys ;stood out as a good option of thermal interface material due to its high thermal conductivity, large working temperature range, and it being liquid at room temperature. Our objective is to optimize properties such as wettability and thermal conductivity through adding other filler materials or alloy metals. In this project, we chose eutectic Ga-In (21.8 wt% In) as the base liquid metal to perform further modification on for its low melting temperature (15.5°C). By preparing different substrates and preparing the eutectic Gallium Indium, we can perform different wettability and thermal conductivity measurements and experiments. Based on our findings, although liquid metal alloy for chip cooling is still in the developing stage, the liquid metal can become a thermal resistance reduction material for industrial use. To reach the goal of ultimately becoming the next generation semiconductor cooling material, further research in corrosion and erosion prevention and discovering measuring techniques for coolants needs to be conducted.

Mentor(s):

Carol Handwerker (Engineering); Yifan Wu (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 507
Presentation Time: Session 3: 2pm-3:30pm

An automated worker-in-the-loop in the construction industry

Author(s):

Aytaj Aslanli† (Engineering); Muhammad Rifqi Priatama Sambodo‡ (Engineering)

Abstract:

Exoskeletons are increasingly being used in the construction industry as a way to reduce the physical strain on workers who are frequently exposed to heavy lifting and repetitive tasks. While studies have examined the potential of exoskeletons to reduce muscle fatigue, not much is known about how they affect cognitive performance, specifically attention. This is an important consideration because attention is critical for identifying hazards in construction sites and preventing incidents. To address this knowledge gap, experiment was conducted to determine the impact of exoskeletons on hazard identification performance. The study involved 13 participants who were asked to identify construction hazards while performing a repetitive manual concrete block lifting task with and without an exoskeleton. The researchers also used a mobile eye tracker and functional near-infrared spectroscopy (fNIRS) to measure the participants' visual and cognitive processes during the experiment. The data was analysed using a t-test to compare hazard identification performance with and without the exoskeleton. The results depicted that wearing an exoskeleton had a negative impact on the attentional distribution of workers, resulting in a lower accuracy for identification of hazards. These findings demonstrate that exoskeletons can affect the cognitive performance of workers and suggest the need for further research to minimise this effect. In conclusion, while exoskeletons have been identified as an effective intervention strategy for reducing physical strain in the construction industry, their impact on cognitive performance, specifically attention, needs to be taken into account depicting the need for future research.

Mentor(s):

Behzad Esmaeili (Engineering); Hyewon Seo (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 508
Presentation Time: Session 3: 2pm-3:30pm

Xenon Team E

Author(s):

Fritz Aude† (Science); Holly Ryan† (Science); Tereas Wan† (Science); Ryken Adams-Barnes† (Engineering)

Abstract:

The XENON1T and XENONnT experiments seek to answer questions revolving around a new dark matter particle candidate, the WIMP (weakly interacting massive particle) through direct detection of particle collisions. The two scintillation events, or flashes of light from these collisions, are the main source of data and analysis within the experiments. NR (nuclear recoil) and ER (electron recoil) are the two groups each collision is categorized into. The existence and mass of WIMPs can be extrapolated if the number of detected NR events is above the expected value by a statistically significant amount. Differentiating between NR and ER is crucial in this experiment. This project utilizes machine learning, specifically convolutional neural networks, to divide the events. Convolutional neural networks differ from traditional neural networks in the inclusion of one or more convolutional layers at the beginning, which makes them better suited to processing analog data. The specific focus of the current research is to compare the advanateges and disadvantages of using preprocessed data points compared to raw wave data. Currently, we have generated the entire wave of a given scintillation event through the given s1 peak, s2 peak, and drift time.

Mentor(s):

Husheng Guan (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 509
Presentation Time: Session 3: 2pm-3:30pm

Design and testing of a low-cost esophageal stent for use in under-resourced medical clinics

Author(s):

Madison Balgeman† (Engineering); Amber Carpenter* (Engineering); Kyle Chang* (Engineering); Kaitlin Zeltwanger* (Engineering)

Abstract:

Rates of esophageal cancer in Kenya and surrounding areas are among the highest in the world. Due to the sparse availability of medical care, diagnoses often occur in later stages, limiting treatment options to palliative care with the goal of prolonging the quality of life. Many Kenyan patients must choose between spending the entirety of their savings on a conventional esophageal stent or resorting to unconventional stenting methods, such as the insertion of a polyvinyl chloride (PVC) pipe to restore patency. In this work, we aim to develop an esophageal stent model that costs less than $10 USD and can be resourced and manufactured locally in Kenya. This requires identifying a high-strength, low-cost, flexible, and biocompatible material. Following previously conducted tensile testing, two fishing lines were identified as strong enough to withstand the forces of the esophagus and external forces due to tumor growth. Cytotoxicity tests are currently being conducted to screen for biocompatibility of these materials, as they do not have a history of use in medical products. In this screening, cell cultures were grown with and without the two different fishing lines present, and images were taken to be analyzed with ImageJ software; ImageJ assists in cell counting and shape analysis to determine cell reaction to materials. A 30% decrease in cell viability would indicate cytotoxicity. The preliminary findings will indicate whether our chosen materials may be viable options to construct low-cost esophageal stents for patient care in Kenya.

Mentor(s):

Aaron Lottes (Engineering); Andrew Brightman (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 510
Presentation Time: Session 3: 2pm-3:30pm

Model Training a Purdue Libraries Responder

Author(s):

Ron Bejerano† (Engineering, Science, Honors)

Abstract:

The purpose of this research study was to train an artificial intelligence model to automate responses to virtual questions submitted by clients to the Purdue Libraries system. In this study, two separate transcripts of previous client-librarian interactions were documented and broken down into four separate categories: Librarian Response, Librarian Question, Patient Response, Patient Question. Through these divisions, the training of the model entailed matching statements to a category only by examining the wording of the content in the statement. A distribution of the data was made to analyze the patterns of responses between client and librarian. The majority of statements made were basic responses to a question. The rest of the data comprised questions asked by one party to the other with roughly 18% of the data comprising this type of response. Testing the model revealed an accuracy score of 90.7%, meaning that the model was correct in its categorizations for the majority of the data it was fed. With a model of this accuracy, future developments could lead to an entirely automated library system which could offer yet another tool to use for the Purdue Libraries staff.

Mentor(s):

Gang Shao (Libraries)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 511
Presentation Time: Session 3: 2pm-3:30pm

Plant – based protein coatings as replacement for egg washes in baked goods

Author(s):

Kara Benbow† (Agriculture)

Abstract:

Plant-based proteins, including pea protein, are one potential environmentally sustainable way of recreating parts of the functionality of eggs. This project used pie crust (flour, shortening and water) as a model baked good system to investigate and characterize key functionalities of pea protein coating solutions including crust browning from Maillard Browning and caramelization, as well as the glossiness of the crust in comparison with egg washes. These characteristics were then compared to egg washes on similarly prepared pie crust. Three solutions of 10% (w/v) pea protein adjusted to pH 8 and glycerol were prepared at ratios of 70%/30%, 80%/20%, and 90%/10% (pea protein/ glycerol, w/w) and applied to the pie crust and baked for 15 and 30 minutes. Different weights of the solutions (1, 2, 4 g) were applied to the pie crusts. The pie crusts were then characterized after baking by measurements of height, Hunter Meter color readings, gloss meter readings, and texture to characterize the coating. Pictures were also taken and used to estimate colorimeter values using a random forest model developed in Python. Results show that pea protein glycerol solutions are all glossier than egg washes, and the 80%/20% ratio gives the highest glossiness. Furthermore, there are not significant differences in any of the colorimeter values at any concentration when applying 1 gram of protein. The random forest model led to reasonable estimates of color. Together, these results offer an alternative for the use of pea protein/glycerol in lieu of egg washes.

Mentor(s):

Jozef Kokini (Agriculture); Harrison Helmick (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 512
Presentation Time: Session 3: 2pm-3:30pm

Denoising Diffusion for Material Topology Sampling

Author(s):

Michael Bezick† (Engineering, Science)

Abstract:

Meta-optical devices use subwavelength-scale antennae to modify the phase and amplitude of light. While there are several benefits to using meta-optics, such as imaging quality and plasmonic enhancement, one drawback is the difficulty of computing efficient material topologies. Generative models, such as variational autoencoders (VAEs), have proven useful for global optimization and metaheuristic frameworks. In this work, we examine the creation of meta-optical material topologies using state-of-the-art denoising diffusion probabilistic models (DDPMs) and compare their generative performance against VAEs. The efficacy of these models will be measured through the Fréchet Inception Distance (FID), a metric which captures similarity of features between the generated dataset and the real dataset. Generative models which achieve better FID scores will be more effective in generating material topologies. As DDPMs have recently been shown to outperform other generative models in certain tasks, this work will investigate whether the generation of material topologies with DDPMs can be used to improve machine learning assisted global optimization techniques.

Mentor(s):

Alexandra Boltasseva (Engineering); Blake Wilson (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 513
Presentation Time: Session 3: 2pm-3:30pm

Effects of sex, breed, and kennel of origin on puppies’ fear responses to novel social and non-social stimuli in commercial breeding kennels

Author(s):

Jenna Boha† (Agriculture, Honors)

Abstract:

High levels of fear and stress can compromise dog welfare, and more research is necessary to address welfare concerns in commercial breeding kennels (CBKs). Fear and stress can be particularly harmful for developing puppies, as it can lead to behavioral problems in adulthood. The aim of this study was to investigate how sex, breed, and kennel of origin influenced puppies’ fear responses toward social and non-social stimuli in CBKs. Eight-week-old puppies (n=290, 32 breeds/crossbreeds, 147 males, 143 females) from 12 CBKs were tested at their kennels of origin. They underwent a three-minute arena test where they were exposed to a fake dog, traffic cone, rubber chicken toy, and unfamiliar person. The time puppies spent showing fear behaviors toward each of the stimuli was continuously recorded. Kruskal-Wallis tests indicated a significant effect of breed and kennel of origin on the duration of fear behavior shown towards the unfamiliar person and toy (p<0.001; Maltese/Yorkie and Havanese had the highest means, respectively). A Mann-Whitney test identified that females (independent of breed) showed more fear responses toward the toy than males (U=9015, p=0.015). There were no differences in puppies’ responses toward the cone or fake dog. Breed differences in fear levels may be dictated by genetics, however, differences between kennels were likely a reflection of different management practices. Future research should investigate risk factors associated with fear in puppies from CBKs at early ages, explore whether and to what degree fear persists throughout puppy development and evaluate management practices that might reduce fear.

Mentor(s):

Candace Croney (Veterinary Medicine); Aynsley Romaniuk (Veterinary Medicine); Shanis Barnard (Veterinary Medicine)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 514
Presentation Time: Session 3: 2pm-3:30pm

Characterization of the Mycobiomes of Three Commercially Important Leafy Green Vegetables

Author(s):

Sean Brown† (Science)

Abstract:

Foodborne pathogen outbreaks such as Escherichia coli O157:H7 are often traced back to vegetables such as leafy greens, which are usually consumed raw. Though many food safety advances have been made to minimize these outbreaks and their effect on human health, many factors of microbes on these vegetables remain unknown. For example, the mycobiome, or community of fungi, associated with these leafy greens is not well understood. For this project, we characterize the mycobiomes of three commonly consumed leafy greens: romaine lettuce, kale, and spinach. We hypothesize that the mycobiome of each vegetable will differ, with different taxa representing primary components of the fungal community. We collected commercially grown romaine lettuce, kale, and spinach from a local grocery store. Once gathered, we processed leaves from each vegetable and extracted fungal DNA using the Wizard Genomic Kit. We sequenced the mycobiome using the Illumina MiSeq platform at Purdue's Bindley Core for Genomics. We focused on amplicon sequencing of the ITS region, which is recognized as the barcode region for the identification of fungi at the species level. Once sequenced, we used bioinformatics tools to determine which taxa are present in the mycobiomes of each leafy green. We expect to have some overlap in the taxa represented between each vegetable with a high variation of many fungal species.

Mentor(s):

Daniel Raudabaugh (Agriculture); Samira Fatemi (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 515
Presentation Time: Session 3: 2pm-3:30pm

How road noise affects migratory birds chorusing patterns in two Tippecanoe County parks

Author(s):

Brynna Buckmaster† (Agriculture, Honors); Sean Giltmier† (Science, Honors); Aidan Hartung† (Science, Honors); Ian Heinig† (Science, Honors); Kya Pierson† (HHS, Honors)

Abstract:

Indiana is in the Mississippi Flyway, an important stopover habitat for migratory birds when returning to breeding grounds after wintering along the Gulf of Mexico. Little work has specifically examined the effects of different road types on dawn and dusk choruses as a measure of biodiversity or how they affect the choruses themselves. In this study, we look at how different distances from the road, 38 and 260 meters, affect the chorusing patterns of migratory species through analyzing the change in acoustic diversity in pre- and post-migratory periods. To do this, we deployed acoustic recording units (ARUs) (n=4) at two temperate forest sites with the invasive plant Amur honeysuckle, Lonicera macckii, in Tippecanoe County, Indiana situated adjacent to different road types and equidistant to Wabash River (305 meters). Each ARU unit recorded one minute of sound at 15-minute intervals for three hours at dawn and dusk during the pre- and post-migratory periods. We compared different acoustic diversity indices, weather variables, and migratory patterns, in a multivariate analysis to understand how distance to roads affects migratory birds. Acoustic diversity indices can be used as a proxy for biodiversity through summarization of the acoustic features of a soundscape in order to pull ecological information. This work will be shared with the Tippecanoe County Parks and Recreation service to assist park decision-makers with management challenges.

Mentor(s):

Kristen Bellisario (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 516
Presentation Time: Session 3: 2pm-3:30pm

Decentralized Wireless Microchip Array For Large-Scale Neural Spike Recording

Author(s):

Lorenzo Cacciapuoti† (Engineering)

Abstract:

The vast majority of current neural recording technology follows the model of a central implanted chip equipped with an array of electrodes. While this model has been the standard for many years and has been used for many successful studies, its implantation and recording methods make it unsuitable for long-term studies and simply too invasive for most human applications. The penetration of the neurons by the electrodes often causes premature cell death, and the complex surgical procedure for implanting these devices makes it hard to replicate on a large scale (especially for human trials). To attempt to solve these problems, we propose a new neural recording device without the need for a central chip or surgical implantation. The device consists of an array of microchips, each chip capable of recording action potentials in neurons without penetrating the cell membrane. These chips then communicate wirelessly with a receiver stationed outside the body whenever they sense a spike so that it can be tracked. Due to their small size, these microchips can be implanted into the brain through an injection without the need for a surgical procedure. While this work is still in the proof of concept stage, we anticipate that this technology could allow for rapid advances in the understanding of the nervous system if made a reality.

Mentor(s):

Mark Johnson (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 517
Presentation Time: Session 3: 2pm-3:30pm

The Effects of Tau Phosphorylation at Serine 262 on Seed-Induced Tau Aggregation

Author(s):

Raul Castro† (Honors)

Abstract:

Alzheimer's disease (AD) is a progressive neurodegenerative disorder for which there are no disease-modifying treatments. One of the neuropathological hallmarks of AD is the accumulation of aggregated, hyperphosphorylated tau within neurons. In AD brain, tau is phosphorylated at multiple pathological sites, and the hyperphosphorylation of tau is believed to occur in a sequentially ordered manner. The phosphorylation of disease-related sites such as S262 was frequently observed in AD brain at the early stage of the disease. Previous research reported that phosphorylation of residue S262 disrupts tau binding to microtubules and inhibits tau fibril formation and cellular seeding activity. However, the effects of phosphorylation at S262 on the aggregation of tau by seeds have not been studied. This research project focuses on expressing tau with a phosphomimetic glutamate mutation and a phospho-null alanine mutation at S262 in rat primary cortical neurons and examining whether either tau mutant can be recruited into aggregates by internalized tau seeds. The methodology used in the study includes producing adenoviruses encoding human tau protein carrying a glutamate or alanine substitution at S262 with an HA tag at the C-terminus, and investigating whether seed-derived, tau insoluble aggregates have HA immunoreactivity by immunocytochemical analysis and by Western blot analysis. The expectations of this study are to (i) identify the role of tau phosphorylation at S262 on its ability to be recruited into aggregates; and (ii) establish a foundation for targeted therapies for pathological tau in neurodegenerative diseases.

Mentor(s):

Chris Rochet (Pharmacy); Sehong Min (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 518
Presentation Time: Session 3: 2pm-3:30pm

"I like to know when my period's coming": How menstruators use technology to track, monitor, and manage their menses

Author(s):

Isabel Cava† (Liberal Arts); Megan Morley† (HHS, Honors); Elizabeth Salwitz‡ (HHS)

Abstract:

Background: Managing menstruation is a global public health issue. Cultural issues such as period poverty and negative stigmas, alongside technological advancements, are often discussed in the menstrual care space. Technologies, such as mobile apps (e.g., Flo, Glow, iPhone Health) and devices (e.g., menstrual cups, intrauterine devices) have changed how menstruators monitor and manage their menses. Little research exists on how these tools could positively affect college-aged menstruators.

Methods: Virtual focus group discussions (n=32 across 5 focus groups) were conducted in February 2021. Eligible participants were student-menstruators attending a large Midwestern University. Thematic analysis techniques were used for data analysis, allowing for a constant comparative approach to data contextualization and theme identification.

Results: Participants revealed they used various technologies to track, predict, and manage their menses, including mobile apps, birth control methods, and reusable products. These technologies aid in symptom tracking, period manipulation, predicting the time of menses, serving as a reference to communicate with healthcare providers, and alleviating menstrual pain and discomfort. Participants also highlighted factors influencing their decisions to utilize technologies, such as menstrual cups, which are economically and environmentally friendly.

Conclusions: Findings offer insights for researchers, app and tool developers, and practitioners regarding how menstruators utilize technologies to monitor, discuss, and make decisions about menstruation. Information can be used to make technological and public health advances in this area. Further, healthcare providers can use these findings to facilitate app-based, data-driven conversations with patients about their menstruation experiences.

KEYWORDS: App, menstruation, pad, tampon, technology

Mentor(s):

Andrea DeMaria (HHS); Risa Cromer (Liberal Arts); Fatimah Lawal (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 519
Presentation Time: Session 3: 2pm-3:30pm

Project Title: Bone Graft Hydrogel Composite Material Tuning for Improved Cell Infiltration and FGF Release

Author(s):

Madelyn Chadwick† (Engineering); Saaniya Rupani† (Engineering, Honors)

Abstract:

Alveolar ridge reconstruction is a procedure that helps restore the jawbone in cases of critical bone defects. Current clinical treatment utilizes a bone particulate-encased titanium mesh along with titanium screws and the occasional use of growth factors like Bone Morphogenetic Protein-2 to improve osteogenesis. Limitations include growth factor content, degree of bone particulate packing, inconsistency in shape, and extent of surgery leading to decreased bone healing. New strategies for bone regeneration involve naturally derived materials such as collagen, Methacrylated Gelatin (GelMa), and Methacrylated Alginate (AlgMa) as supporting hydrogels for tricalcium phosphate, along with investigating growth factor release for improved osteogenesis. This study aimed to characterize both AlgMa, GelMa, and combinations of the two, in order to produce a robust hydrogel with controlled release of Fibroblast Growth Factor 2 (FGF-2) that could improve cell infiltration and differentiation. Furthermore, the resulting hydrogel must also withstand hydrolytic degradation during osteogenesis. To isolate a specific hydrogel, various dilutions and concentration cell sweeps were performed to identify a viable combination. Studies evaluating the pH, swelling, and degradation of the optimized combination demonstrated stable physiological pH, slow degradation, and improved swelling, resulting in increased porosity and high cell proliferation. Strain and frequency sweeps were utilized to evaluate the viscoelastic properties, demonstrating the effect of manipulating the combination of hydrogel ratios to tune mechanical and degradation properties. The studies contribute to bone graft regeneration research by providing data supporting improvement in cell infiltration and chemotaxis due to FGF-2 release for the optimized hydrogel combining AlgMa and GelMa.

Mentor(s):

Luis Solorio (Engineering); Claudia Benito Alston (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 520
Presentation Time: Session 3: 2pm-3:30pm

Natural Language Processing Applications to Biomedical Literature

Author(s):

Madison Charnigo† (Engineering, Honors)

Abstract:

As the quantity of information in biomedical fields is rapidly increasing, there is a need to be able to efficiently extract insights about biomaterial without having to manually read and annotate the large quantity of published information available. Within this context, Natural Language Processing (NLP) pipelines can be used to collect data from thousands of scientific articles and identify important information. This work facilitates the construction of a biomedical NLP pipeline, which can expedite the identification of novel material for applications in life sciences.

Mentor(s):

Arezoo Ardekani (Engineering); Gaurav Kumar (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 521
Presentation Time: Session 3: 2pm-3:30pm

Girls Excelling in Math and Science (GEMS) Clubs: Stories of the Original GEMS Girls

Author(s):

Meredith Chasse† (Education); Grace Gochnauer‡ (Education)

Abstract:

Girls Excelling in Math and Science (GEMS) clubs were started in 1994 by Purdue alumna, Laura Jones, when her daughter came home and told her that math was hard. From the beginning, the goal of GEMS has been to ensure that girls see themselves as change agents, problem-solvers, technology entrepreneurs, engineers, scientists, and as people who make a difference. Since then she created a network of GEMS clubs and a website with resources for those interested in starting a club. In 2017, the founder bequeathed GEMS to Purdue's College of Education to continue her legacy and the work of promoting STEM to girls. To explore the impact of GEMS on the girls who have participated, we contacted the girls who participated in the original GEMS club (hereafter, we call them the OGGs) to collect their stories. We conducted individual and focus group interviews with nine OGGs, now women with careers and families of their own. We implemented a thematic analysis of the interview transcripts; several themes emerged related to GEMS: career, family, gender, and mathematics. All OGGs were able to identify particular aspects of their GEMS experiences which prepared them for their current careers, and mentioned ways in which they have continued the mission of GEMS with girls (e.g., daughters, nieces) in their own lives. From our analysis, we intend to compile their stories into a book in which we highlight OGGs' voices and the impact of GEMS on their lives.

Mentor(s):

Jill Newton (Education)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 522
Presentation Time: Session 3: 2pm-3:30pm

The Proportion of Other-Sex Friends Does Not Moderate the Association Between Peer Smoking Norms and Smoking Behaviors for Female Adolescents.

Author(s):

Liying Che† (HHS, Pharmacy)

Abstract:

Smoking initiation and other-sex friendship development tends to occur during adolescence (Johnston et al. 2009; Mrug, 2011). On average, other-sex friends express more positive attitudes toward smoking which is associated with increased smoking behaviors among their friends (Grard et al., 2017; Mrug, 2011). Female adolescents may be more easily affected by their friends’ smoking attitudes (Jessor, 1973); the more positive attitudes friends have toward smoking, the more likely female adolescents are to smoke regularly (Chassin, 1986). As other-sex friends may be more related to smoking for female adolescents, we hypothesize that higher perceived positive smoking norms from peers and friends is associated with higher severity of smoking and having a higher proportion of other-sex friends will amplify this association.

Participants were 225 females, aged fifteen to nineteen years (M=16.60, SD=0.81). Adolescents reported the amount of other-sex friends in their friend group (0=all same-sex to 4=all other-sex). Ever trying tobacco products was dichotomously coded. Peer smoking norms averaged the smoking behaviors among classmates with adolescents’ perceived friend approval for smoking (0=no smoking, high disapproval to 4=all students smoke, high approval). Proportion of other-sex friends was correlated with peer smoking norms, r=0.28, p<0.05. Logistic regression showed no effects, □2(N=177)=6.45, p=0.17 for proportion of other-sex friends (OR=0.81, 95%CI[0.27, 2.42], p=0.70), peer smoking climate (OR=1.45, 95%CI[0.47, 4.48], p=0.52), or their interaction (OR=1.08, 95%CI[0.58, 2.02], p=0.80). Thus, peer smoking climate is not associated with having ever tried a tobacco product and proportion of other-sex friends does not moderate the association.

Mentor(s):

Kristine Marceau (HHS); Amy Loviska (HHS); Sohee Lee (HHS); Michelle Rogers (Brown University); Kristina Jackson (Brown University)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 523
Presentation Time: Session 3: 2pm-3:30pm

Lane Detection Efficiency between Machine Learning and Edge Detection Algorithm

Author(s):

Evan Chen† (Engineering); Paloma Arellano† (Engineering); Hyoju Kang† (Engineering); Shao Ning Huang† (Engineering); Ryan Davitt† (Engineering); Atharva Thakur† (Engineering)

Abstract:

Lane detection is one of the most important tools to ensure driving safety. It allows drivers to stay in lane, which is one of the best ways to avoid accidents for drowsy driving. To improve on current lane detection techniques, detecting lanes using machine learning is one of the methods. This study explores possible ways to implement machine learning on lane detection using existing models as well as customized data. Then, it compares the result with one of the lane detection algorithms using edge detection. After training the machine learning models using Roboflow, the algorithm can detect lanes in a straight path. However, the detected lanes are outlined in a rectangular box instead of a polygon even though the annotated images have a polygon outline. The rectangular box only provides the range of where the lane is, but it does not outline the exact lane. Therefore, we concluded that it needs more improvement, and we decided to use a customized model to outline lanes more accurately. The result of edge detection, on the other hand, can detect the lanes in a wide variety of conditions. Even though currently, the edge detection algorithm has a better overall ability to detect lanes, we strongly believe the machine learning model will outperform after training it with customized data to outline the lanes with more precision.

Mentor(s):

Shreya Ghosh (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 524
Presentation Time: Session 3: 2pm-3:30pm

Origin and Function of Perlecan in Drosophila Retinal Basement Membrane

Author(s):

Annabella Chen† (Science)

Abstract:

Perlecan is a glycoprotein responsible for the tensile nature of lattice-like structural linkages containing integrin-linked kinase (ILK) and collagen within the basement membrane of the Drosophila melanogaster retina. Contractile tension of the basement membrane is necessary for maintaining the convex shape of the retina and involves the tightening of stress fibers into a mesh of rigid folds. This stretches rings of extracellular matrix (ECM), known as grommets, through which photoreceptors exit the basal surface of the retina. To understand the role of perlecan in the structural development of the basement membrane, the origin of perlecan production must be investigated. This was accomplished by performing Drosophila genetic crosses to build flies containing a mosaic of RFP-labeled perlecan from either interommatidial cells (IOC) or hemocytes and GFP-labeled perlecan in the basement membrane to detect the source of perlecan via mosaic patterns of fluorescence. Flies with RFP-labeled perlecan from hemocytes were observed to have complementary mosaic patterns, resulting in the conclusion that perlecan must originate from hemocytes. The effect of perlecan on the collagen framework was then observed using flies where perlecan was selectively silenced in either IOC or hemocytes to confirm the origin of production and examine its structural significance on stress fibers. A lack of normal contractile tension and stress fiber ridges when perlecan was silenced in hemocytes reinforces that perlecan is produced by hemocytes and identifies perlecan as an important contributor to the tensile property of the basement membrane and, thus, retinal curvature.

Mentor(s):

Henry Chang (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 525
Presentation Time: Session 3: 2pm-3:30pm

Ordered Micro-scale Surface Patterning via Vibrational Standing Waves

Author(s):

Nicholas Christ† (Engineering)

Abstract:

Surface roughness is an important factor in interfacial mechanics, influencing the contact behavior of a material. Engineering of surface roughness has been used for a variety of applications including anti-fouling, hydrophobicity, haptics, and adhesion. This project takes inspiration from Ernst Chladni, who demonstrated that a flat sheet of metal could vibrate in different modes, creating complex patterns of nodes and anti-nodes. These patterns can be manipulated by changing the frequency and dampening applied to the substrate. This research seeks to create standing vibrational waves in a liquid polymer surface to be cured in-situ, resulting in a solid polymer with ordered microscale and smaller surface patterns. This was first studied by macroscale experimentation with granular media on a latex membrane substrate. By altering the frequency and amplitude of the applied force, different patterns were produced by the granular media settling into the nodes of the vibrating membrane. The system was then modeled using finite element analysis to determine the combinations of substrate shape, size, and mechanical properties, frequency range, and method of force application needed to achieve desired results. These results will guide design for an experimental apparatus for further work with UV-curable polymer media.

Mentor(s):

Chelsea Davis (Engineering); Tyler Roberts (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 526
Presentation Time: Session 3: 2pm-3:30pm

Molecular cloning for CRISPR/Cas9 mediated genome editing

Author(s):

Chloe Chui† (Agriculture, Honors)

Abstract:

CRISPR/Cas9 technology has been used in a variety of procedures and experimental models. Derived from a bacterial defense system which involves acquired immunity against foreign DNA and viruses, the CRISPR/Cas9 system is capable of creating a site-directed double-stranded DNA break using a guide RNA (gRNA), which directs the Cas9 nuclease to initiate said breakage in the desired portion of the DNA. CRISPR/Cas9 offers researchers a way to edit genes precisely and effectively. Due to the ability of researchers to customize gRNA so that a double stranded breakage can be accomplished in a directed part of the genome, CRISPR/Cas9 has a wide variety of applications. In this study, induced mutagenesis of plasmids via PCR, transfection into E.coli, and cloning of selected colonies are used to generate precursors to the desired gRNA sequence for CRISPR/Cas9 mediated genome editing. As the desired plasmids with the induced mutations are purified and confirmed, processes using restriction enzyme double digestion and ligation allow for the creation of plasmids with the final gRNA sequence. Using the expressed gRNA, the CRISPR/Cas9 system can then be used to cut CAND1 and CAND2 proteins at specific sequences in order to investigate the functions and interactions of CAND1 and CAND2.

Mentor(s):

Xing Liu (Agriculture); Kankan Wang (Agriculture); Lihong Li (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 527

Presentation Time: Session 3: 2pm-3:30pm

Treating SARS-CoV-2: Creativity and Computer Algorithms

Author(s):

Olivia Clegg† (Engineering, Honors)

Abstract:

Proteins have specific functions influenced by amino acid sequences and overall structure. As new biological threats are introduced, new needs for synthetic proteins are being recognized. In the case of the SARS-CoV-2 virus, infection occurs when the virus's spike receptor-binding domain (RBD) binds to the ACE2 receptor of a cell. The goal of this project is to design a protein that has a stable structure and a higher binding affinity to SARS-CoV-2's RBD than that of ACE2. If a protein designed with a higher binding affinity is introduced in the same setting as the SARS-CoV-2 virus and other cells, the virus will bind to the designed protein rather than the cells, thus preventing infection. Foldit, a computer software based using the Rosetta algorithm, is used in conjunction with human creativity to assist with protein design. Discovering a stable protein that blocks infection could introduce new treatments, treatment methods, and advancements in protein design: with the combination of the Rosetta protein modeling algorithm and human creativity, AI can learn what goes into making a stable and efficient protein. The designed protein is currently a triple helix bundle, including an alpha-helix fragment of the ACE2 receptor that has been adjusted and modified with different amino acids and secondary structures to increase stability. The protein's stability will be determined by the score given by the Foldit software, which is a measure of Gibbs free energy. If given access to more time and resources, the protein would be created in a lab and tested for efficiency in preventing cellular infection.

Mentor(s):

Zahra Tehrani (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 528

Presentation Time: Session 3: 2pm-3:30pm

Annotating Genes 149-226 of Bacteriophage SrishMeg2525

Author(s):

Thomas Coleman† (Engineering); Isha Nair† (HHS, Honors); Katie Chan† (Pharmacy, Honors); Matthew Trotter† (Engineering); Karla Dominguez Omaña† (Engineering, Honors); Alana Hernandez† (Engineering); Frank LoRusso† (Engineering)

Abstract:

Bacteriophages are viruses that specifically infect and replicate within bacterial cells, and studying their structure and function can be an avenue into huge advancements and has interdisciplinary applications. To manipulate a phage’s structure and function, each gene in a discovered phage must be manually analyzed. Studying the auto-annotated genes of phage SrishMeg2525 of Cluster C1 indicate there may be ones that need to be added or deleted. With the use of databases like DNA Master, Phamerator, Starterator, and GeneMark, comparison of different potential start sites of each gene can occur, allowing compilation of enough evidence to determine the most likely sites. They can be utilized to view genes of phages in the same cluster with similar structures to make the most reasonable assessment. Performing this analysis on the unique reverse-coding gene, Gene 189 showed evidence from the databases that suggest it may not be a gene at all and should be deleted. One sign of abnormality is its unusually short base-pair length. Only one similar reverse gene was found, in phage Roots 515. Finding an auto-annotated gene that likely does not exist and should be deleted, suggests that there may be more like it in this phage. It shows the importance of going through each individual gene and investigating further. More such discoveries can lead to a better understanding of certain phages and the ability to utilize them to make real-world impacts.

Mentor(s):

Kari Clase (Agriculture); Adam Quinn (Agriculture); Daphne Fauber (Engineering); Anjana Narayanan (HHS); Arya Shembekar (Science)

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Poster Presentation Abstract Number: 529
Presentation Time: Session 3: 2pm-3:30pm

Using Gas Chromatography with General Chemistry Students

Author(s):

Mackenzie Crum† (Science)

Abstract:

First year General Chemistry students seldom encounter instrumental lab techniques such as gas chromatography. We have developed a straight forward General Chemistry experiment using gas chromatography to analyze a mixture of two compounds, cyclohexane and toluene, which mix well together because they have similar structures. Our procedure enables students to create mixtures at various concentrations. The mixtures are run through the gas chromatograph enabling students to separate the two compounds and analyze the composition of each mixture. It was found that the carbon nanotube chemoresistance detector in the gas chromatograph is more sensitive to toluene, which led to a higher response on the resulting chromatogram. To account for this compound dependent sensitivity, we devised a calibration curve correlating detector response to volume of toluene or cyclohexane injected. This calibration curve enables students to correctly determine the composition of various mixtures to within ± 10%.

Mentor(s):

Jon Rienstra-Kiracofe (Science)

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Poster Presentation Abstract Number: 530
Presentation Time: Session 3: 2pm-3:30pm

Attitudes, behaviors, and risk perceptions toward aquatic invasive species among boaters in Illinois and Indiana

Author(s):

Cody Dateno† (Agriculture)

Abstract:

Aquatic invasive species (AIS) have transformed the ecology of the Great Lakes and remain a major threat to the health and biodiversity of the lakes. Recreational boating is a major vector of potential invasions as many boaters do not consistently perform the recommended steps to help prevent the spread of AIS. Although there is relatively high awareness of AIS among boaters, there is a gap between boater awareness and boater preventative actions. Understanding boaters’ attitudes, risk perceptions, and behaviors toward AIS can help resource managers and outreach staff design effective policies, communications products, and outreach interventions to address this gap. Although there has been past qualitative and quantitative research done on these questions, there is a need for additional research in some of the under-studied Great Lakes states. To address this need, we conducted an online survey of registered boaters in Illinois and Indiana and asked them about their attitudes, risk perceptions, and prevention behavior toward AIS. Our results elucidate key drivers of AIS prevention behaviors and offer suggestions for how to successfully communicate about this critical issue.

Mentor(s):

Stuart Carlton (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 531
Presentation Time: Session 3: 2pm-3:30pm

Effects of cooling heat stressed sows on circadian rhythms of cortisol and melatonin

Author(s):

Corrin Davis† (Agriculture, Honors); Elizabeth (Ellie) Fisher‡ (Agriculture)

Abstract:

Heat stress has profound effects on swine physiology and production, with lactating sows particularly vulnerable due to high metabolic demands. Recent genome wide association analysis determined that 2 of 5 genes that commonly mediated heat stress response were core circadian clock genes (ARNTL and NPAS2). Thus we hypothesized that alteration of circadian rhythms is a component of the heat stress response. Our objective was to determine if cooling heat-stressed sows would impact their circadian rhythms of salivary cortisol and melatonin. During a 48-h period of an intermittent heat wave (high ambient temperature of 36.7ºC and 35ºC on day 1 and 2, respectively) in June 2022, saliva samples were collected every 4 h from lactating (12±4 days postpartum) Duroc X Landrace sows (N=18) housed in farrowing crates with electronic cooling pads (cooled; n=9) or without (heat stressed; n=9). Salivettes secured with hemostats were placed in sows' mouths and held to be chewed for 2 min. Saliva was collected from salivette by centrifugation and samples were frozen and stored at -80ºC until analysis. Saliva was extracted with 100% Methyl tert-Butyl Ether (MtBE), and melatonin and cortisol were measured using liquid chromatography tandem mass spectrometry. Concentration was calculated relative to an ISTD standard (0.5ng d4cortisol/d4melatonin). Time affected saliva melatonin levels. Cooling tended (P=0.06) to increase melatonin across the 48 h, and treatment by time interaction was found (P<0.05). Cooling had no effect of saliva cortisol. Data support our hypothesis. Since melatonin is a potent antioxidant further studies are warranted.

Mentor(s):

Theresa Casey (Agriculture); Allan Schinckel (Agriculture); Wonders Ogundare (North Carolina A&T University)

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Poster Presentation Abstract Number: 532
Presentation Time: Session 3: 2pm-3:30pm

Gestalt sleep coding in warriors with posttraumatic stress disorder and their spouses: Measurement lessons learned

Author(s):

Anthony DeSanto† (HHS); Melanie Clayton† (Science, Honors)

Abstract:

Abstract Redacted.

Mentor(s):

AJ Schwichtenberg (HHS); Amy Janis (HHS); Maggie O'Haire (University of Arizona)

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Poster Presentation Abstract Number: 533
Presentation Time: Session 3: 2pm-3:30pm

SWARM Simulation Platform: Algorithm Benchmarking and Development Suite for Multi-Agent Systems

Author(s):

Avi Dube† (Engineering)

Abstract:

The SWARM Simulation platform provides a novel web-based application for researchers to design, implement, and evaluate multi-agent flight control algorithms while reducing computational requirements for the end users. The current web simulator is getting redesigned to become accessible, professional, and secure with AWS Cognito. We are developing various environments, such as realistic forests and gamified levels, to evaluate drone algorithms. In addition, we are building low-level controllers that stabilize drone maneuvers for users to test their algorithms quickly. We are also developing an obstacle avoidance algorithm to detect multiple obstacles and display 3D visualizations of the updated path. Our future plans include creating a dense city environment and implementing intuitive checkpoint and object recognition systems to support applications such as disaster management and package delivery.

Mentor(s):

Shreyas Sundaram (Engineering); Tong Yao (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 534
Presentation Time: Session 3: 2pm-3:30pm

The influence of deer hunting season on black vulture home ranges in the Midwest

Author(s):

Alex Dudley† (Agriculture, Honors)

Abstract:

Little is known about black vulture (Coragyps atratrus) spatial ecology in the Midwest because their populations have expanded to include this region recently. Research into black vulture spatial ecology from other portions of the species' distribution revealed movements depend on habitat structure and foraging opportunities. Studies of mammalian predators demonstrate that species' home ranges can change during hunting seasons in response to the pulse of available carrion. Thus, we hypothesize that black vultures shift their space use patterns during white-tail deer (Odocoileus virginianus) hunting season in Indiana. To test this hypothesis, we will quantify black vulture home ranges in Indiana and compare estimated home ranges between hunting and non-hunting season. Data from 6 GPS tagged black vultures will be used for this analysis. Preliminary results from analysis of one bird demonstrates that home ranges constrict during the hunting season. We also expect that vultures will spend more time near forests during hunting season because carrion from hunter harvest is presumably more common there. Our poster will also compare the home ranges size estimates from our birds to previously published data in the Southeastern United States to understand if space use differs between regions. Finally, if our analyses demonstrate that black vultures change space use in response to pulsed resources associated with deer hunting, vultures might also shift space use in response to other resource pulses, such as afterbirth and stillbirths from livestock. Such shifts might help explain some of the conflict between black vultures and livestock producers.

Mentor(s):

Patrick Zollner (Agriculture); Marian Wahl (Agriculture); Grant Burcham (Veterinary Medicine); Lee Humberg (U.S. Department of Agriculture); Bryan Kluever (U.S. Department of Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 535
Presentation Time: Session 3: 2pm-3:30pm

Development of VBA-Based Software for Efficient Nursing Home Staff Scheduling

Author(s):

Lekha Durai† (Engineering)

Abstract:

Given that the US population is aging and that nurse shortages are increasing, more research needs to be done to adequately schedule nursing home staff while meeting multiple constraints, and to create the means for automated scheduling with high-quality user interface. Inefficient and ineffective nurse scheduling is common in various healthcare facilities and particularly poses a concern to nursing homes. It is detrimental to both nursing staff and residents, as staff face high levels of stress and burden and perform less than optimally, and residents thus receive lower quality care and experience decreased health outcomes. Scheduling in current practice is often experience-based and thus can produce highly suboptimal solutions for both nurses and residents.

We develop a nurse scheduling software solution, which allows multiple hard constraints (based on, for example, fluctuating staff demand, labor policies on consecutive shifts worked, the distribution of nurses with varying qualifications, and nurse availabilities) to be met. Our application is written in the Visual Basic for Applications (VBA) programming language and embedded in Excel. The user can also add optional soft constraints that are preferred to be met though can be relaxed if need be, such as shift preferences of nurses. Moreover, the user can specify relative weights of importance of different constraints. This work will help nursing home operators easily schedule their staff and spend less time doing so, allowing many constraints to be met to maximize the performance of nurses and improve outcomes for both nurses and residents.

Mentor(s):

Nan Kong (Engineering)

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Poster Presentation Abstract Number: 536
Presentation Time: Session 3: 2pm-3:30pm

Half-Precision floating point extension for RISC-V

Author(s):

Michael Foster† (Engineering); Khoi Pham‡ (Engineering)

Abstract:

In computer systems, floating point numbers operations are carried out in a separate module called a Floating Point Unit (FPU). This project aims to design, implement, and test this unit in Purdue System-on-Chip Extension Technology (SoCET)'s new AFTx07 chip. This FPU will use the half-precision binary floating-point number format as normalized by the IEEE 754-2008 standard. In this format, half precision floating point numbers utilize 16 bits in total with 1 sign bit, 5 exponent bits, and a 10 bit mantissa. This allows for faster computations than standard 32 bit floating point, at the expense of the range of numbers which can be represented as well as the precision of those numbers. This unit is designed to quickly perform standard arithmetic operations (including subtraction, addition, multiplication, and rounding) and storage. The individual arithmetic modules will be written in SystemVerilog, as well as the testbenches for verification of the modules. The implementation of the half-precision floating point extension for the RISC-V core will allow our chip greater functionality, and more efficient means of performing complex calculations.

Mentor(s):

Mark Johnson (Engineering); Cole Nelson (Engineering)

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Poster Presentation Abstract Number: 537
Presentation Time: Session 3: 2pm-3:30pm

Virtual Super-resolution Optics with Reconfigurable Swarms

Author(s):

Julia Gabennesch† (Engineering); Erik Zabalegui Lopez* (Engineering)

Abstract:

VISORS (Virtual Super-resolution Optics with Reconfigurable Swarms) is a solar corona inquiry space physics project that will aid in seeing and studying the heat release zones at the Sun surface. With an unparalleled precision of 0.2 arcseconds, the pair of two formation-flying CubeSats carrying the optical payload (OSC) and detector (DSC) will capture the extreme ultraviolet features of the Sun. The six-month mission challenges include complying with relative orbit restrictions during scientific investigations and preserving a number of cutting-edge technologies for perfect formation flying. For the mission to be successful, it is essential that all CubeSat payload components match their temperature requirements. In this work, Thermal Desktop software is used to perform a thermal analysis for multiple flight modes of a CubeSat swarm. Several modifications pertaining to the temperature needs of particular components incorporated into the latest version of the Cubesats' thermal models are illustrated and discussed. In particular, thermal simulations of the avionics boardstack showed that the component's heat strap is no longer needed when applying a more realistic duty cycle. In addition, detailed door mechanisms are embedded in the DSC model, including open and closed configurations for obtaining more accurate results.

Mentor(s):

Alina Alexeenko (Engineering); Petr Sergeyevich Kazarin (Engineering); Evgeniia Vorozhbit (Engineering)

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Poster Presentation Abstract Number: 538

Presentation Time: Session 3: 2pm-3:30pm

Including branched-chain volatile fatty acids (BCVFA) in dry dairy cattle diets affects calf muscle metabolic activity, but not colostrum fat or protein

Author(s):

Brianna Gast† (Agriculture); Evy Tobolski* (Agriculture); Lauren Jones* (Agriculture)

Abstract:

We hypothesized that feeding BCVFA to late gestation dairy cows increases protein and fat in colostrum and increases muscle metabolic activity in their calves. Forty-two days before expected calving, non-lactating Holstein cows (n=40) were enrolled into the study and fed either with control (CON; soy hulls) or BCVFA supplemented diet. BCVFA consisted of isobutyrate (30g DM) methylbutryate (15g DM), and isovalerate (15g DM). Calves were enrolled at birth and fed the dam’s colostrum <4h (10% body weight) and 12 h (5% body weight) postnatal. At 24 h post-natal, a biopsy of the semitendinosus muscle was collected to muscle metabolic activity was measured using a resazurin assay, which indirectly measures NAD+ reduction to NADH as fluorescence every 15 min. Calves born to cows fed BCVFA (2505555 ± 444156 fluorescence · g of tissue-1 · 15 min-1) had greater (P = 0.01) muscle metabolic activity than those born to control (2505555 ± 444156 fluorescence · g of tissue-1 · 15 min-1). The Bicinchoninic acid (BCA) assay analysis determined protein percent of colostrum was not different between treatments nor was percent fat, as determined by creamatocrit (P>0.10). Immunocrit of calf serum was analyzed to determine passive transfer of antibodies and found not different between treatments (P>0.10). The mechanism of BCVFA needs to be further researched, but data demonstrate that maternal nutrition affects calf’s muscle metabolism.

Key words:

Branched-chain volatile fatty acid

Colostrum composition

Calf Muscle

Mentor(s):

Theresa Casey (Agriculture); Linda Beckett (Agriculture); Kyrstin Gouveia (Agriculture); Jacquelyn Boerman (Agriculture)

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Poster Presentation Abstract Number: 539
Presentation Time: Session 3: 2pm-3:30pm

Brain on a Chip: Studying the Mechanisms of Parkinson's Disease through Multi-Modal Biosensors

Author(s):

Maya Godbole† (Engineering)

Abstract:

Parkinson’s disease (PD) is a progressive disorder impacting 2-3% of those 65 years and older. The central nervous system is targeted, leading to symptoms such as rigid muscles, tremors, chronic pain, cognitive impairment, and bradykinesia. There is a need for better tools to study the causal mechanisms of environmental and hereditary factors in the epigenetic development of PD. To this end, we have developed a multi-modal lab on a chip. This device incorporates both optical recombinant biosensors and electrochemical sensors into a single microfluidic channel suitable for neuronal cell culture. The optical biosensors can measure intracellular neurotransmitters (e.g., L-glutamate and dopamine) and epigenetic changes, and the electrochemical sensors can measure extracellular neurotransmitters and metabolites (e.g., lactic acid). At this point we have confirmed the functioning of each component part of the device and that we can culture neurons on top of the glutamate sensors in a microchannel. What remains is integrating them together into one system that can measure neuronal cells culture through each mode simultaneously in real time. Towards this end, we need to study the effect of cell cultures, Matrigel, and cell culture media on the glutamate sensors over time under incubator conditions (37°C and 5% CO_2). These conditions may degrade sensor performance (detection limit and sensitivity) over time, interfere with sensing mechanisms or block the target analyte from reaching the sensors. We have incubated glutamate sensor microchannels under various combinations of cell culture conditions and used amperometry (current v. time with fixed potential) to regularly calibrate the sensors and track changes to detection limit and sensitivity. Then, we examined devices with microscopy, probe electrical measurements, and electrochemical techniques, to investigate failure mechanisms. This study is important to realizing a multi-modal lab on a chip for PD, and better understanding the failure mechanisms of enzymatic electrochemical sensors in cell culture systems.

Mentor(s):

Hyowon Lee (Engineering); James Nolan (Engineering)

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Poster Presentation Abstract Number: 540
Presentation Time: Session 3: 2pm-3:30pm

AFTx07 Power Management Unit

Author(s):

Sean Greenley† (Engineering)

Abstract:

AFTx07 is a RISC-V based microcontroller designed by the System on Chip team here at Purdue that is to be taped out later this year. This group focused on designing and implementing a power management unit into the AFTx07, in order to conserve the power used by the chip. Limiting power is key, as the AFTx07 is designed to be a low-power microcontroller. The implementation of the power management unit was done through the process of clock gating and a clock manager, which ensures that the clock is only being run to the chip and peripherals when they are needed for operation. This saves switching power, with the charging and discharging of the load capacitance decreasing due to the disabled clock. The clock manager module, as well as other submodules, were written in SystemVerilog to properly describe the hardware, with Verilator being used for simulation of the design. Finally, after integration with AFTx07 through FuseSoC, synthesis was used to generate reports when it comes to the amount of dynamic power used by the chip, and the power consumption was benchmarked using Embench. The decrease in power usage makes the chip more efficient, allowing for it to perform more processes while consuming less energy than before.

Mentor(s):

Cole Nelson (Engineering); Mark Johnson (Engineering)

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Poster Presentation Abstract Number: 541
Presentation Time: Session 3: 2pm-3:30pm

Families Experiencing Homelessness or Housing Insecurity: A Literature Review of Family Resilience

Author(s):

Kelly Haddow† (HHS)

Abstract:

Background: Families in crises such as families experiencing homelessness or housing insecurity are exposed to stressors that place their mental and physical health at risk. These strains also negatively impact family dynamics. Family resilience has been found to play a protective role for families in crises. To understand how family resilience shapes family's ability to overcome and rebound from disruptive life challenges, this study conducted a literature review guided by Froma Walsh's family resilience framework. Specifically, we sought to identify studies that explored the framework's nine processes around the beliefs, organization, and communication of families in order to understand how these enable families to overcome adversity.

Methods: We reviewed the medical and social science literatures (PSYCHInfo and PubMed) to identify peer-reviewed journal articles published from 2000-2023 that reported family resilience from the perspective of Froma Walsh's framework. We used search terms for population, exposure, and outcome.

Results: Of the 137 articles, 127 articles remained after duplications were deleted and initial screening was conducted. Two independent researchers conducted a title and abstract screening after which only 38 articles were determined to meet inclusion criteria.

Conclusions: By cataloging how researchers have used Froma Walsh's framework of family resilience with families in crises, in particular families experiencing homelessness/housing insecurity we provide scholars and practitioners a current research landscape and reference regarding the role of family resilience in this vulnerable population.

Mentor(s):

Yumary Ruiz (HHS); Kaitlin Brown-Krapf (HHS)

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Poster Presentation Abstract Number: 542
Presentation Time: Session 3: 2pm-3:30pm

The Necessity of Supporting the Development of Genetically Modified Organisms for Food Production in our Modern Age

Author(s):

Abby Hagan† (Science)

Abstract:

It is well-understood that GMOs are a relatively uncharted territory in the world of agriculture. Nevertheless, it is important that efforts be made to develop GMOs to benefit humanity in a time of rapid environmental change. The present work is intended to convince readers of the importance of GMO development, as it may be one of the only ways humans can sustainably feed themselves in the future. To this end, academic sources have been summarized to encompass both the benefits and costs of GMO development. It was discovered that, logically, GMO research should be supported for the following reasons: GMOs are better fit to survive variable effects of climate change better than organic crops, the lower resource requirement of GMOs makes them more sustainable for developing nations, and GMOs are associated with higher food production than organic crops. In order to suit the needs of humans in the future, further research must be put into GMO development.

Mentor(s):

Qian Wang (Liberal Arts)

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Poster Presentation Abstract Number: 543
Presentation Time: Session 3: 2pm-3:30pm

Teaching Medical Students Effective Communication Skills with Culturally and Linguistically Diverse Patients

Author(s):

Sophia Hagedorn† (HHS, Honors); Emily Deldar† (HHS); Mackenzie Greulach† (HHS, Honors)

Abstract:

Our main goal is to develop a curriculum which integrates the use of Spanish-speaking Standardized Patients (SPs) in the training of medical students. In addition, we aim to determine the impact of this interprofessional curriculum innovation on the preparation and readiness of our medical students to implement culturally appropriate, evidence-based treatment plans to manage health problems in the Hispanic/Latino population.

A recent study from the Barbara Bush Foundation reported the astounding cost of low adult literacy rates in the United States: $2.2 trillion annually. Quality of life depends on our ability to comprehend language, read, and write. Hispanic Latino individuals in Indiana are more likely to have speech, language, communication, and/or literacy disorders. Our collaboration with Indiana University's School of Medicine aims to train SPs to portray individuals with communication and/or literacy difficulties who have common medical complaints/conditions. In addition, our medical students will receive training in how to effectively communicate with individuals with limited communication and literacy skills, as well as to how to effectively collaborate with interpreters and speech-language-hearing professionals. Ultimately, we aspire to enhance our medical students' ability to demonstrate effective communication and inter-professional collaboration to deliver personalized care that meets the health and literacy needs of Hispanic/Latino patients and their families.

Mentor(s):

Françoise Brosseau-Lapré (HHS); Itzel Matamoros (HHS)

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Poster Presentation Abstract Number: 544
Presentation Time: Session 3: 2pm-3:30pm

Rapid Assay for High Risk HPV Detection

Author(s):

Francesca Hamacher† (Engineering)

Abstract:

Human papillomavirus (HPV) is a virus that is an extremely common sexually transmitted infection (STI) that can lead to cervical cancer. A rapid-diagnostic test, similar to an in-clinic COVID-test, is imperative to testing communities and devising a treatment plan for communities underserved by traditional cervical cancer screening. The goal of the project is to develop a rapid test that can determine if someone is HPV positive while also having a high sensitivity, affordability, and requiring little to no special equipment. One method used by this test is recombinase polymerase amplification (RPA) which copies DNA at an affordable cost. RPA essentially does the same thing as nucleic acid amplification, however, it is isothermal and can be performed at a more affordable cost. Specifically I have been optimizing the RPA assay for sensitivity and adapting it to display results on a user-friendly lateral flow strip format. So far, we have established a limit of detection of 1000 HPV DNA copies per 50 µL reaction.

Mentor(s):

Jackie Linnes (Engineering); Luke Brennan (Engineering); Natalia Rodriguez (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 545
Presentation Time: Session 3: 2pm-3:30pm

A Dive Into Regenerative Braking

Author(s):

Richard Hambleton† (Management); Cristopher Pulaski‡ (Management)

Abstract:

This research covers the usefulness and applicability of a regenerative braking system in today's urban society and

in racing. There are multiple ways to create this system and this

research gives a brief description of a few methods and their

added pros and cons. Regenerative braking has many beneficial

impacts, but it also has its own drawbacks. All of these topics

are explored and explained through my presentation.

Mentor(s):

Shreya Ghosh (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 546

Presentation Time: Session 3: 2pm-3:30pm

Motivating Factors for Initiating and Terminating Eating Events

Author(s):

Alison Hannon† (HHS, Honors)

Abstract:

Previous studies have assessed the biological and environmental influences on eating. While biological factors may provide a basis for feeding decisions, environmental drivers appear to play a dominant role, especially where access to food is not a barrier. Understanding the controls of food choice and intake is critical for weight management. The primary purpose of this study was to determine the primary motivating factors for initiating and terminating eating events. Further analyses conducted in March determined whether an individual’s demographic characteristics, typical eating pattern, and chronic appetitive sensations have an effect on their primary reasons for initiating and terminating eating events. This study involved 50 adult participants from who completed baseline measurements and surveys eliciting demographic and personal eating behavior data. 25 of these participants then completed a survey soliciting informant about reasons for initiating or terminating ingestive events after every eating occasion on 2 non-consecutive weekdays and one weekend day. In addition, they completed hourly surveys about their appetitive sensations on one weekday and one weekend day. The findings of this study could be used for more effective, individualized weight management plans.

Mentor(s):

Rick Mattes (HHS); Heather Eicher-Miller (HHS); Anita Panjwani (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 547
Presentation Time: Session 3: 2pm-3:30pm

Undergraduate Student Understanding of Data Variabiltiy

Author(s):

Kayla Huter† (HHS, Science); Anna McCoy† (Pharmacy)

Abstract:

This study aims to evaluate undergraduate students' understanding of data variability in biology. We are interested in understanding how students interpret error bars, how the number of semesters at the collegiate level affects student's interpretation of error bars, and how student understanding of variability explains their interpretation of error bars. An online assessment to study student graphing practices also contains questions about variability within and between treatments for different graph types. Around 1000 students have completed the assessment as an assignment. Quantitative and qualitative responses along with demographic and institution type were collected from each participant. We used an open-ended response: “What type of information do the error bars provide about the data represented” to develop a code book using a subset of responses from several courses and by coding across courses. Preliminary results have shown that students' understanding of error bars can be grouped into four categories: all-encompassing terms, form of error, defining by example, and trend analysis. All-encompassing terms and forms of error show less understanding of the error bars, while defining by example and trend analysis show greater understanding of the error bars. Coded responses will be analyzed using statistical methods. We expect students who have attended more collegiate semesters to exhibit more comprehension of error bars. We also expect students with an increased comprehension of variability to have a better understanding of error bars. Through this study, we anticipate a better understanding of how students interpret variability so that teaching quantitative reasoning skills can be improved.

Mentor(s):

Lauren Stoczynski (Science); Stephanie Gardner (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 548
Presentation Time: Session 3: 2pm-3:30pm

Ethics in Clinical Research Performed in Low-Income Nations

Author(s):

Jinho Hwang† (Pharmacy)

Abstract:

Clinical research is a necessary part of development in the medical field. Because of this testing on human subjects has become a necessary procedure in the production of drugs. With its abundance came the need for ethical boundaries protecting the subjects through a series of laws and honorary codes that the researchers must follow. However, large institutions have started to exploit low-income nations with citizens desperate for money by performing non-ethical human testing. Covid 19 virus caused an increase in these breaches in the ethical code. According to Nih.gov, the common problems for clinical tests were the use of a placebo, the coerciveness to less fortunate parties, and utilize their desperation. The paper highlights the importance of enforcing the standard protocols in clinical trials, especially in groups that are exploitable. According to the FDA, their response to the public health emergency during covid was that while new procedures are implemented, the safety of the patient must be assured when deviating from the standard procedures.

Mentor(s):

Qian Wang (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 549
Presentation Time: Session 3: 2pm-3:30pm

Racial Diversity in Childrens Books

Author(s):

Emma Jacobs† (Education); Emily Abernathy‡ (Education); Siana Fox‡ (Education); Nadia Brooks‡ (Education); Eunice Barron-Ribas‡ (Education); Ariel Hart‡ (Education); Karah Lee‡ (Education); Philip Patchan‡ (Education); Anna Lopez‡ (Education)

Abstract:

The purpose of this study is to evaluate racial diversity in books incorporated into classrooms ranging from grades 1st through 5th. This project is based on the books teachers utilize within their classrooms. The literature review demonstrated that there is a lack of racial diversity and misrepresentation within children's books (Atkins, L. (2013); Braga, A. (2022); Coleman & Harrison, (2022); Fleming, N. (2019); Davis et al., (2004); Martinez, A. (2022), Monoyiou & Symeonidou, (2016); Schwartz, S. (2020); Stechyson, N. (2019)). Within this study, nine elementary education undergraduate students, partaking in the same college class, were provided books by mentor teachers that are used or are planning to be implemented within the classroom this school year. The students began by identifying the title, grade level, Lexile measure, guided reading level, and summary of the given books. Additionally, they identified the author(s), the main character, and the secondary character's race in the books. Data was then transferred into an organized spreadsheet and formulated into graphs. The demographics of the school area, the school itself, as well as the individual classrooms, was also analyzed. Factors such as racial diversity, socioeconomic status, and academic achievement were taken into consideration. The forthcoming study suggests that including diverse literature promotes cultural and racial inclusivity within the classrooms. With a lack of diversity, we risk losing the opportunity to build community and create environments without bias and prejudice. Diverse books allow our minority students to have a mirror and a window of opportunity for the future.

Mentor(s):

Inna Abramova (Education)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 550

Presentation Time: Session 3: 2pm-3:30pm

Domain Adaptation using Pre-trained Object Detection Models 2 for Traffic Control Devices in Other Geographical Regions

Author(s):

Kyochul Jang† (Science)

Abstract:

Automated inspection systems for object detection using computer vision techniques can help manage traffic control devices(TCD) effectively. However, the main challenges of TCD detection models are the shortage of datasets for training and the difficulties in creating datasets due to the lack of research in different domains. To address this issue, this study provides a benchmark for using data from other relevant domains. Three model cases were developed in this study with different training methods: (1) training using COCO-based pre-training weights, (2) training using pre-trained weights from the source domain, and training using a synthetic dataset of data from the source and target domains. The results of comparing the model cases show that source domain data cannot be directly applied to the target domain and that the pre-trained weights of the source domain help to build the target model efficiently. These results contribute a baseline for practitioners when building TCD models with a minimum of their own data.

Mentor(s):

Kyu Kang (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 551
Presentation Time: Session 3: 2pm-3:30pm

Developing Machine Learning Physics Informed Neural Networks to Replace Forward Stimulation of Transcranial Electric Stimulation

Author(s):

Pravin Jayatissa† (Engineering)

Abstract:

Transcranial electric stimulation (TES) can induce brain neuronal network activity and modulate measurable changes in brain function and behavior. TES is currently considered a promising therapeutic tool for mental diseases including depression to chronic neuropathic pain. TES is a non-invasive brain stimulation technique where electric current using two or more electrodes on the scalp is delivered to induce electric (E)-fields in the brain. The brain induced E-field dose is recognized as the determinant of TES's effects. As such, computational E-field dosimetry is commonly used to determine the placement (location of scalp) and current levels (duration and intensity) of TES electrodes. This project aims to improve E-field dosimetry tools for TES by developing fast solvers based on Physics Informed Neural Networks. We have developed large datasets to train these networks by developing head models from Magnetic resonance images (MRI) processed using FreeSurfer, the FMRIB Software Library (FSL), and simulation of non-invasive brain stimulation (SimNIBS). These datasets have been used to train several network architectures and are being used to design accurate Physics-informed neural networks (PINN) for TES computational E-field dosimetry.

Mentor(s):

Luis Gomez (Engineering); Nahian Hasan (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 552
Presentation Time: Session 3: 2pm-3:30pm

Special Areas: Inclusive and Positive Classroom Practices with Elementary-Aged Students with Disabilities

Author(s):

Jacob Jenkins† (Education); Jordan Potter† (HHS); Emma Jones‡ (Education, Honors); Lydia Zhang‡ (Education)

Abstract:

This qualitative study explored the development of positive relationships between pre-service special education teachers and their students in elementary classrooms. Participants completed a series of activities during their classroom field experiences. These activities were completed outside of instructional time, including attending special area classes, such as art, physical education, library, and music. Pre-service teacher reflections were analyzed. Nineteen pre-service teachers, majoring in special education, wrote a reflection on their experiences observing in special areas classrooms. The content of each participant's reflection was then coded by the research team and analyzed for themes. Data analysis is ongoing and we are presenting preliminary results. Themes such as the importance of building relationships with students and learning about other aspects of teaching will be discussed in this poster. The themes identified thus far, signify a need for practices that encourage pre-service teachers to explore inclusive and equitable classroom practices.

Mentor(s):

Jennifer Smith (Education); Jasmine Begeske (Education)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 553
Presentation Time: Session 3: 2pm-3:30pm

Granzyme A Regulates Gut Microbiota via Induction of Antimicrobial Peptides

Author(s):

Navjot Kaur† (Science)

Abstract:

Immune cells that reside within the intestinal tract produce a number of inflammatory mediators (i.e. cytokines and granzymes) that allow for optimal intestinal function. Cytokines are known to enhance epithelial cell barrier function, while the role of immune-derived granzymes remains less clear. Therefore, the goal of my research is to determine how granzymes contribute to intestinal function and alter microbial compositions. In my initial findings, I observed a direct correlation between the expression of granzyme A, a serine protease, and expression of the anti-microbial peptides Reg3b/Reg3g that regulate the gut microbiota. Reg3b and Reg3g are produced by Paneth cells within the intestinal tract and regulate gram negative bacteria within the gut. Therefore, I hypothesize that granzyme A is needed for intestinal Reg3b/Reg3g production and regulation of bacteria in the gut. To test this hypothesis, I measured Reg3b and Reg3g mRNA expression in the intestine of WT and Gzma-/- mice by real-time PCR and collected fecal material for 16S rRNA sequencing to assess changes in microbial communities. In these studies, I found that Gzma-/- mice have significantly reduced expression levels of Reg3b and Reg3g as compared to WT controls. Through 16s rRNA sequencing, a method used to measure the composition of the gut microbiota, I found that Gzma-/- mice exhibited an altered gut microbiota as compared to WT controls. These data suggest that granzyme A may modulate the intestinal microbiota via regulating anti-microbial peptide production and altering microbial compositions. My future work will focus on the mechanisms by which Gzma induces antimicrobial peptide production and how this impacts intestinal health and disease.

Mentor(s):

Matthew Olson (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 554
Presentation Time: Session 3: 2pm-3:30pm

Low Temperature Solution Processed Synthesis of Chalcogenide Perovskites Using Organometallic Precursors

Author(s):

Shriya Khandelwal† (Engineering)

Abstract:

Chalcogenide perovskites are a class of materials that have recently garnered interest due to their good environmental stability and low band gaps,often in the ideal range for applications related to solar cells.In literature only a small number of chalcogenide perovskites have been experimentally made with BaZrS3 being the most extensively studied out of them due to its higher thermodynamic favourability.One of the greatest challenges of using chalcogenide perovskites for applications in solar cells is that temperatures greater than 800°C have traditionally been required for synthesis,making them incompatible with substrates and contacts used in solar cell production.The lowest temperatures that have been reported in literature by Zilevu et.al.,range from 365 °C to 275 °C.This was done using metal amide barium and zirconium precursors in oleylamine solution and the synthesized BaZrS3 did not show any significant luminescence.In this paper,we present a solution-processed route using organometallic precursors in carbon disulfide solution used to synthesize luminescent BaZrS3 at temperature as low as 575°C with sulfurization for one hour.

The synthesis process we developed utilizes organometallic barium and zirconium precursors dissolved in a solvent containing sulfur to form a precursor ink.This ink was then blade coated onto a glass substrate and then annealed in an atmosphere containing sulfur at a temperature of 575°C for times ranging from 1 hour to 16 hours.The material resulting from this process show a PXRD diffraction pattern with a ternary phase and a Raman spectrum that corresponds with previously documented standards.The material also showed a photoluminescence peak centered at 1.77ev.

Mentor(s):

Rakesh Agrawal (Engineering); Apurva Pradhan (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 555
Presentation Time: Session 3: 2pm-3:30pm

Human Factors Healthcare

Author(s):

Gaeun Kim† (Engineering); Tongwei Zhang‡ (Science)

Abstract:

3D human reconstruction is a prevalent task in the computer vision domain. This task contains deep neural network (DNN) models capable of taking a 2D image containing multiple people as input and generating a 3D human body mimicking each person's body shapes and poses (i.e., the rotation of each body joint). Given the shapes and poses, the generated human body can be further described by the Skinned Multi-Person Linear (SMPL) model with a 3D mesh containing 6890 vertices and the 3D location of body joints. Since there are open-sourced data with ground truths of 2D/3D locations of multiple joints in pixels or camera coordinate systems, most DNN models learned the shapes and poses by aligning the resulting locations of joints (from the SMPL model) with ground truths. However, lacking the ground truths of rotational information of joints can lead to unreasonable estimates of body poses, such as an incorrect shoulder abduction angle from images containing the side view of the body. Ambiguity exists in using joints' locational information to estimate joints' rotational information. This study aims to develop a large dataset containing images of human bodies from multiple views and ground truths of joint rotational angles measured by wearable Inertia Measurement Units (IMUs). With proper model fine-tuning and adjustment, we expect that the performance of the DNN for 3D human reconstruction tasks can be improved and suitable for applications such as ergonomics assessments.

Mentor(s):

Denny Yu (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 556
Presentation Time: Session 3: 2pm-3:30pm

Dataset for Humans’ Intrusive Behavior Towards Robots

Author(s):

Soomin Kim† (Polytechnic Institute)

Abstract:

As robots become more prevalent in everyday life, instances of people harassing robots are also becoming more frequent. Delivery robots, for instance, can detect pedestrian intent and avoid their path, but they are still exposed to personal interference due to curiosity or malice. Such intrusive behavior towards robots can lead to delivery delays, robot malfunctions, and property damage. Despite the remarkable advancements in computer vision and sensing technology through artificial intelligence, robot systems are still unable to distinguish between the different actions of people who intentionally interfere with them. To address this problem, we aim to first understand and analyze individual behavior patterns that hinder robots. We plan to collect various human data, including physiological and human behavioral data, to achieve this goal. Accordingly, we will conduct experiments to collect data on behavior of people when they approach robots with curiosity and intentionally block their path. With this dataset, we hope to improve the ability of robots to intelligently distinguish between harmless individuals and those attempting to obstruct them.

Mentor(s):

Byung-Cheol Min (Polytechnic Institute); Go-eum Cha (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 557
Presentation Time: Session 3: 2pm-3:30pm

Different introduction histories and climatic distribution patterns among three congeneric invasive anurans

Author(s):

Jack Kirkwood† (Science); Addy Messerly‡ (Science)

Abstract:

Human activity often causes the movement of species from their native range to new locations where they can become established. Climate conditions in these new locations are often different from those under which the species evolved. Understanding the introduction histories of invasive species and investigating patterns associated with their ability to establish under novel conditions provide valuable insights, as biological invasions are a serious threat to global biodiversity. Here, we use publicly available occurrence data and published locality records to reconstruct the invasion history of three congeneric frogs native to the Caribbean. To characterize and compare the climate conditions in their native and non-native ranges, we use the bioclimatic variables from the WorldClim database. Reconstruction of the species' introduction histories revealed species-specific introduction histories between the three species. However, we found that each species has colonized and established populations in locations with significantly different climatic conditions from their native range, suggesting these species' share the ability to expand their physiological niche. Plasticity under novel environmental conditions, rapid adaptations, or both could underlie the expansion outside of their native range. Overall, this study highlights how closely related species from the same geographic area may follow diverse introduction pathways, and can have different establishment success and responses to novel climatic conditions when introduced to a new area.

Mentor(s):

Ximena Bernal (Science); Andrew Mularo (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 558
Presentation Time: Session 3: 2pm-3:30pm

TensorFlow Model Garden: MaskFormer and Mask2Former - Data Preprocessing and Augmentation

Author(s):

Erik Kocinare† (Engineering); Alexiy Buynitsky‡ (Science)

Abstract:

Introduction: The MaskFormer and Mask2Former models propose that mask classification is sufficient to do both semantic and instance segmentation tasks. Additionally, the papers mention specifically that per pixel classification is not necessary in order to complete these tasks.

Purpose: In order to confirm the replicability of the models, our team must ensure that on the data preprocessing and augmentation level, everything is able to be reproduced with little to no error. The reproduction effort will be done in TensorFlow, while the original is done using PyTorch. Additionally, after completing this step, the larger team will be able to continue on with confirming the replicability of the rest of the model.

Methods: The TensorFlow Model Garden requires differential testing on all levels in order to ensure the results of the original model can be verified and that there is zero chance involved with similar results, but due to some unforeseen cause. In this case, our team compares the preprocessed image and masks from the PyTorch implementation with our own.

Mentor(s):

James Davis (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 559
Presentation Time: Session 3: 2pm-3:30pm

SoCET: Integrated GPGPU Tapeout

Author(s):

Zachary Lagpacan† (Engineering, Honors); Guillaume Hu† (Engineering); Om Gupta† (Engineering); Ansh Patel† (Engineering)

Abstract:

The goal of the SoCET (System-on-Chip Extension Technologies) team is to design a family of microcontrollers and manufacture them on custom silicon. The aim of this project is to understand the GPGPU (General Purpose Graphics Processing Unit) execution model and integrate components of an open-source GPGPU into a tapeout. GPGPUs are required for maximizing throughput of workloads that involve massive data parallel computing such as in graphics rendering and machine learning. This is achieved with the SIMT (Single Instruction Multiple Threads) execution model which leverages multithreaded, data-parallel vector operations to simultaneously manipulate many pieces of data. We propose an integration of this critical hardware component with our in-house SoC architecture. We will analyze its functionality and performance in a system-level benchmark comparing the SoCET CPU without the GPGPU, the SoCET CPU with the GPU, and a comparable CPU-GPU system under a representative set of data-parallel workloads. Metrics of interest in this analysis will be the increase in performance on data-parallel workloads, along with the tradeoff factors of increased area and power consumption.

Mentor(s):

Mark Johnson (Engineering); Tim Rogers (Engineering); Manikanta Tiruveedula (Engineering); Raghul Prakash (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 560
Presentation Time: Session 3: 2pm-3:30pm

Avionics Development for the FEMTA Suborbital Spaceflight Experiment

Author(s):

Max Lantz† (Engineering)

Abstract:

The Film-Evaporation MEMS Tunable Array (FEMTA) is a micro-electromechanical system (MEMS) thruster with a small form factor and miniscule power requirement. It uses ultrapure deionized water as propellant to control the attitude of a CubeSat. Two experiments are under development to test FEMTA's capabilities in vacuum and microgravity. One tests the performance of a unique propellant management system which passively supplies propellant to the thruster. The second experiment is a thrust measurement device designed to characterize thruster performance in microgravity. Both experiments will launch on a Blue Origin New Shepard rocket payload in 2024 to collect data during suborbital flight.The maturation of the FEMTA Suborbital Spaceflight Experiment across prior semesters has led to the development of an Arduino-driven avionics system. This system leverages a Feather M0 Adalogger flight computer alongside pressure, temperature, and acceleration sensors to determine its flight phase and trigger operation of each experiment at the appropriate time. During operation, propellant flow, pressure, and temperature characteristics along with thrust characteristics are recorded and stored by the flight computer. In order to increase the robustness of the flight phase detection algorithm, a split moving average method is used to minimize false state detections due to sensor fluctuations. The phase detection algorithm is to be tested using realistic flight profiles of pressure and acceleration across mission time. Upcoming thermo-vacuum and vibration testing of the electronics will be conducted to determine our hardware's flight readiness.

Mentor(s):

Jesus Meza-Galvan (Engineering); Steven Pugia (Engineering); Anthony Cofer (Engineering); Alina Alexeenko (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 561
Presentation Time: Session 3: 2pm-3:30pm

Analyzing Sail Performance through Optimization of Model Renders for NASA Solar Cruiser

Author(s):

Andy Le† (Science); Will Oberly† (Engineering); Elliot Wong† (Engineering); Katie Kneeland† (Engineering); Andrew Modin† (Engineering); Becca Reinecke* (Engineering)

Abstract:

NASA's upcoming research mission, Solar Cruiser, will be studying a novel propulsion method, enabling new vistas for the purpose of heliophysics and solar storm monitoring. A propellantless gossamer structure called a solar sail will utilize solar radiation pressure to perform maneuvers and alter inclinations of the spacecraft. The sail's condition will be monitored through the use of a camera remaining in a single-fixed position with the capability to capture data for sail performance analysis and public engagement. The software team is researching cutting-edge algorithms to render a three-dimensional model from a single image without the use of distance markers. This challenge forces focus on alternative image processing methods to estimate sail shape. A three-dimensional transmutation algorithm will utilize public license neural network models, manipulated to fit and trained on our set of test images, to produce a detailed and accurate representation of a quadrant of the solar sail. To achieve this, the algorithm will be refined and adapted through a series of experimental tests with images from previous missions, leading to continuous improvement and training of the model in preparation for the launch. Further collaboration with the simulated-view team will develop the image dataset. The updated model will provide researchers with a clearer image of the solar sail's position relative to the sun, its optical acceleration, and structural integrity, enabling more detailed analysis of the sail. From this result, the software developed will equip NASA with accurate data on sail performance and integrity through images produced by the context camera.

Mentor(s):

Tony Cofer (Engineering); Alina Alexeenko (Engineering); Andrew Binder (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 562
Presentation Time: Session 3: 2pm-3:30pm

Effect of resistance training and dietary protein modification on skeletal muscle fat content in older adult women

Author(s):

Rebecca Lewis† (HHS); Sarah Preston‡ (HHS); Chloe Garrett‡ (HHS, Honors); Hannah Winstone‡ (HHS); John Vanos‡ (HHS); Lucas Stouder‡ (HHS)

Abstract:

We assessed the effects of consuming a U.S.-Style Healthy Dietary Pattern (HDP) with higher protein predominantly from lean beef, compared to a HDP with normal protein or higher protein HDP lower in beef on changes in skeletal muscle intermuscular fat (IMAT) and subcutaneous adipose tissue (SAT) in older women who performed 12-weeks of resistance training emphasizing the thigh muscles. For this investigator-blinded study (Purdue IRB 2019-218), 36 healthy women (age: 66±1 y) were randomized to consume a U.S.-Style HDP with: 1) high-protein emphasizing unprocessed lean beef (HP-Beef, 1.4g/kg body weight/d); 2) HP with mixed protein sources (HP-Mixed); or 3) lower-protein (LP-Mixed, 0.8g protein/kg BW/d). Magnetic resonance imaging (MRI) of the quadriceps muscles was completed at baseline and at intervention week 12 to assess quadriceps IMAT and SAT. IMAT decreased with time but only in the LP-Mixed (-7.4□2.8%) and HP-Beef groups (-9.5□2.7%; p<0.05; HP-Mixed: 3.6□3.5%, p>0.05). Similar results were noted for SAT, with a decrease (p<0.05) noted in the LP-Mixed (-9.7□2.4%) and HP-Beef (-8.9□1.8%) but not the HP-Mixed (-5.4□1.9%, p>0.05) group. In conclusion, resistance training resulted in reductions in IMAT and SAT but these effects where limited to the LP-Mixed and HP-beef groups. The lack of change in the HP-Mixed groups is surprising and requires further investigation. While a HDP did not impact IMAT or SAT during resistance training, the Dietary Guidelines for Americans recommends that older women habitually consume a HDP to promote skeletal muscle health.

Mentor(s):

Chad Carroll (HHS); Wayne Campbell (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 563
Presentation Time: Session 3: 2pm-3:30pm

Towards Prediction of A User's Identity from Missing Biometric Data from IoT Devices and Understanding Associated Risks

Author(s):

Chi-Wei Lien† (Science); Natsu Yamamoto† (Polytechnic Institute)

Abstract:

Abstract Redacted.

Mentor(s):

Sudip Vhaduri (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 564
Presentation Time: Session 3: 2pm-3:30pm

Visual exploratory behavior when solving a novel foraging task in European starlings and House sparrows

Author(s):

Nathaniel Lindsay† (Science); Gaurangi Yadav* (Science); Adriana Torres* (Science)

Abstract:

Foraging strategies dictate much of a species' behavior and anatomy. However, the connection between unique foraging strategies, information gathering (exploration), and novel foraging behaviors (innovation) remains unknown. In this study we aim to investigate how differing foraging strategies affect visual and tactile exploratory behaviors, as well as how these behaviors relate to innovation success. We compare the exploration and innovation processes of two species with distinct foraging strategies: European starlings (Sturnus vulgaris), which rely on tactile information to locate food, and House sparrows (Passer domesticus), which rely on visual information to locate food. Using puzzle box treatments designed to reflect these species' strategies, video data is collected and analyzed using the programs Behavioral Observation Research Interactive Software and Deep Lab Cut. Video analysis is ongoing, but we hypothesized (1) on account of the visually oriented behaviors used by House sparrows, precise visual information about the stimulus is required for innovation; diverse visual exploratory behaviors could provide information needed for innovation. Therefore, we predict House sparrows display more diverse visual exploratory behaviors compared to European starlings. We hypothesized (2) tactile exploration yields higher innovative success compared to visual exploration because physical contact with stimuli increases opportunities to innovate by chance. We also considered the alternate hypothesis that tactile exploration yields precise information needed to generate specific problem-solving behaviors. We predict that in European starlings, contact behaviors in general will negatively correlate with latency to solve the box.

Mentor(s):

Jeffrey Lucas (Science); Rebecca Trapp (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 565
Presentation Time: Session 3: 2pm-3:30pm

Outreach and Communication of Sociogenomics Research: (Patterns of item nonresponse behavior to survey questionnaires are systematic and have a genetic basis)

Author(s):

Kathryn Malerbi† (HHS)

Abstract:

Response to survey questionnaires is vital for social and behavioral research, and most analyses assume full and accurate response by survey participants. However, nonresponse is common and impedes proper interpretation and generalizability of results. Item nonresponse behavior was examined across 109 questionnaire items from a large prospective epidemiological cohort, the UK Biobank (UKB; N=360,628). Phenotypic factor scores for two participant-selected nonresponse answers, “Prefer not to answer” (PNA) and “I don’t know” (IDK), were highly genetically correlated with one another and with education, health, and income, with additional unique genetic effects observed for both PNA and IDK that enhance our understanding of nonresponse behaviors in survey research.

When developing research related to behavioral genetics and sociogenomics, it is important to acknowledge and understand the dark history of pseudoscientific discrimination and genetic essentialism which underlies the study of behavioral outcomes in genetics. Along with this history comes a responsibility for genetics researchers to carefully consider and develop robust ethical protocols when conducting their research, especially in the area of behavioral genetics and sociogenomics. Ethical implications are also considered in the outreach and communication of research results. Due to these concerns, a supplemental FAQ was developed by examining other sociogenomic research FAQs and identifying questions and conclusions that may be of interest to readers of the publication. Outreach and communication of research and research results to those who may interact with sociogenomic research is essential when discussing the implications of sensitive topics related to behavioral genetics outcomes.

Mentor(s):

Robbee Wedow (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 566
Presentation Time: Session 3: 2pm-3:30pm

Impact of COVID-19 on Homebirths in the United States

Author(s):

Aubrey Mann† (Liberal Arts)

Abstract:

The option of one's own home as a birth location is not new, but today giving birth at home comes with many challenges such as legal consequences, lack of access, and social pressure to conform to pregnancy norms. Despite this, the number of homebirths occurring across the United States is rising at exponential rates. This upward trend may be linked back to the pandemic and a reluctance to go to COVID-19-populated hospitals to give birth. Using pre-existing data on those who give birth at home, we can support our research to find out whether or not COVID-19 has had an impact on peoples' birth locations. Over the course of this research, birthing people, doulas, and midwives were interviewed to give us more information on which factors seem to determine whether or not someone will choose to give birth at home. With this data, we also examined the connection between birthing locations and quality of treatment. Using personal testimony and data from the Midwife Alliance of North America, we are able to create a general understanding of homebirth situations and how these positively and negatively impact those involved. Currently, our understanding is that the main reasons for people choosing to have homebirths had to do with the fear of being separated from one's newborn, the fear of giving birth alone, and the fear of catching COVID-19. These findings suggest that the perception of homebirths as a safe alternative to hospital births is increasing due to influences from the COVID-19 pandemic.

Mentor(s):

Amanda Veile (Liberal Arts); Meredith Aulds (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 567
Presentation Time: Session 3: 2pm-3:30pm

Implications of Partial Gene Alignment in the Bacteriophage SrishMeg2525

Author(s):

Kendall Massey† (Engineering); Race Medema† (Engineering); Bailey Williams† (Agriculture); William Petrusson† (Agriculture); Violeta Saldarriaga† (Science, Honors); Patricia Casaca† (Science)

Abstract:

Bacteriophages are viruses that replicate by infecting bacteria, and are known to be genetically diverse and mutate regularly. With so much genetic variation, the SEA-PHAGES program facilitates the categorization of bacteriophages and their genetic data. To study these genes, the DNA of bacteriophages is sequenced and compared to similar bacteriophage strains in the same cluster. The specific bacteriophage that this research is centered around is SrishMeg2525, which belongs to the C1 cluster. SrishMeg2525's genes were analyzed with DNA Master, Phamerator, GeneMark, Starterator, HHPred, DeepTMHMM, and PhagesDB. Using these programs, SrishMeg2525's genes were compared to similar bacteriophages and their genes were aligned. The genetic variation of bacteriophages causes a number of protein-coding genes to differ slightly between strains, making these genes exhibit partial alignment to one another. Of the partially aligned genes within SrishMeg2525's genome, the gene between base pairs 50957-51874 was notable. The gene was predicted to code for the enzyme Holliday Junction Resolvase, but only in the latter half of the gene. This research explores whether partially aligned genes within SrishMeg2525 are enough to define the function of its genes and the proteins associated with them.

Mentor(s):

Kari Clase (Agriculture); Aaron Quinn (Agriculture); Daphne Fauber (Engineering); Anjana Narayannan (HHS); Arya Shembeckar (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 568
Presentation Time: Session 3: 2pm-3:30pm

Feasibility of Lead Exposure Assessment in Blood Spots using Energy-Dispersive X-ray Fluorescence

Author(s):

Kiernan McCormickk† (HHS)

Abstract:

Collecting blood spots from newborns is a common procedure used to diagnose multiple health conditions. Fingerstick blood samples are routinely collected from children to diagnose elevated blood lead levels. In our study, we wanted to test the feasibility of using a high-power energy-dispersive X-ray fluorescence (EDXRF) device to accurately measure the concentration of lead in blood spots. We created spotted standards of a known concentration of lead on a filter paper at different volumes and concentrations. We determined the detection limit for lead through repeated measurements of our standards and calibration line slopes. We also tested the variability of the measured lead concentration across procedures and spotted blood volumes and found no significant additions to uncertainty in measurements. Finally, we compared blood lead concentrations measured by EDXRF and atomic absorption spectroscopy (AAS)

and found EDXRF to be a significant predictor of blood lead (n = 22, R = 0.98, p value <0.001) with an average detection limit of 1.7

μg/dL of blood lead. This detection limit is similar to that of the AAS technique, which is commonly used in clinical testing

laboratories for blood lead surveillance. These findings provide a proof of concept that blood spots measured by EDXRF may be

used as a surveillance tool for lead exposure, even at elevated blood lead levels of 2−3 μg/dL.

Mentor(s):

Aaron Specht (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 569

Presentation Time: Session 3: 2pm-3:30pm

Impact of the gut microbiota on intestinal non-genomic estrogen signaling

Author(s):

Kate McNulty† (Science)

Abstract:

Women are less likely to develop ulcerative colitis than men, suggesting a protective role of estrogen in this disease pathogenesis. Sex-specific susceptibility to colitis has been related to a protein involved in the non-genomic signaling activity of estrogen, G-protein coupled estrogen receptor 1 (GPER). Specifically, a greater intestinal expression of GPER has been found in men with colitis compared to healthy controls, but not women. Microbes residing in the gastrointestinal tract (i.e., the gut microbiota) are thought to be a modulator of both colitis pathogenesis and sex hormone homeostasis. However, the regulatory effect of gut microbiota on intestinal estrogen signaling remains unclear. We hypothesized that the presence of the gut microbiome can influence intestinal GPER activity by comparing gene expression levels between germ-free mice that lack any intestinal microorganisms and conventionally raised mice that harbor their natural microbiome. GPER expression in male C57BL/6 mice was measured using RT-qPCR in three segments of the intestines: the distal colon, proximal colon, and ileum (n=7-13/group). We observed that the presence of the gut microbiome leads to a lower expression of GPER in the ileum. However, no difference was observed in the proximal or distal colon. The results of this study suggest that gut microbiota may be capable of impacting GPER expression in the small intestine but not the large intestine. Future work will examine the interactions of specific microbes and microbial metabolites on GPER expression.

Mentor(s):

Tzu-Wen Cross (HHS); Abigayle Simpson (Agriculture); Anna Clapp Organski (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 570
Presentation Time: Session 3: 2pm-3:30pm

Investigation of a Negative Lead Time Tornado using the X-band Teaching and Research Radar (XTRRA)

Author(s):

Emma Miller† (Science); Matthew Graber‡ (Science)

Abstract:

This study looked at a negative lead time tornado case of a supercell tornado in Tippecanoe and Carroll counties on June 25th, 2021. In this context, “negative lead time” means that a tornado was initially unwarned by the local National Weather Service office (NWS). Multiple factors like tornado intensity on the Enhanced Fujita scale, distance from the nearest NWS radar, and sequencing of the tornadoes from the same storm (e.g., first versus second) can impact if a timely warning is issued for a tornado. We compared data from XTRRA located near Purdue’s campus, to that of the NWS Indianapolis radar (KIND) which is used in the warning decision process. The Warning Decision Support System Integrated Information (WDSS-II) system from the National Severe Storms Lab (NSSL) was used to convert XTRRA and KIND data into the same format for data visualization and to derive azimuthal shear fields. We restricted azimuthal shear, which highlights radar velocity gradients and is used as a proxy for rotation, to the supercell and tornadic regions. In the supercell, KIND detected lower peak azimuthal shear than XTRRA; indicating that the rotation in this storm wasn’t depicted well on NWS radar. KIND missed the near-surface rotation, where XTRRA, located much closer to the storm, picked up the azimuthal shear gradient very well. This case of a negative lead time tornado warning demonstrates the usefulness of supplemental radar coverage.

Mentor(s):

Robin Tanamachi (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 571
Presentation Time: Session 3: 2pm-3:30pm

Using Digital Imagery and Computer Simulations to Improve Student Glassware Readings in Lab

Author(s):

Valerie Minnick† (Science); Ted Tobias* (Science)

Abstract:

Reading laboratory glassware is a common skill that is taught in both high school and collegiate laboratories. Despite being taught proper technique, students often struggle to obtain accurate readings. This can lead to poor results in laboratory experiments. The purpose of this research is to investigate methods of improving the accuracy and precision of chemical glassware readings performed by students. To do this, students were asked to determine the volume of water contained in a graduated cylinder and in a burette. Students were also asked to determine the volume of water contained in a photograph of a graduated cylinder and a burette. Our results support the idea that students read glassware more accurately by reading photographs. Our results also show that students can improve their glassware reading results by first participating in a simulated glassware reading tutorial. The standard deviation for reading a burette improved by a factor of two (0.068 mL to 0.034 mL) after students completed the simulation tutorial. These results suggest the use of digital imagery and chemical education software can assist chemistry students in achieving more accurate results in the lab.

Mentor(s):

Jon Rienstra-Kiracofe (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 572
Presentation Time: Session 3: 2pm-3:30pm

Meteorological Investigation of a Possible Undocumented Tornado in Puerto Rico on 17 June 2012

Author(s):

Marco A. Monrouzeau† (Science, Honors)

Abstract:

Tornadoes are a rare occurrence in the island of Puerto Rico. This case study examines a potentially undocumented tornado captured on video o n17 June 2012. From the video, there are signs of a tornado and some other attendant cloud features, but the low quality prevented confirmation that it was a tornado. Our working hypothesis was that the event captured in video was indeed a tornado, but to confirm this we first needed to reject the null hypothesis that both the atmospheric environment and storm were not supportive of tornado development. We analyzed specific atmospheric conditions from that day to determine if they were conducive for a tornadic event. We evaluated observations collected by a radiosonde the morning before the event, since it was more representative of the pre-convective environment. After examining stability indices calculated from radiosonde data and Doppler radar imagery, we found atmospheric conditions were marginally likely to produce supercells, which are the thunderstorm type responsible for producing most strong tornadoes. Although the results point toward the existence of a tornadic event, additional evidence needs to be explored, including whether surface damage occurred. We intend to submit our evidence to the National Weather Service in Puerto Rico for evaluation and possible entry into the official U.S. tornado record.

Mentor(s):

Robin Tanamachi (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 573
Presentation Time: Session 3: 2pm-3:30pm

Comparison of craters in different regions of the Moon and implications for volcanic infilling

Author(s):

Kyle Morin† (Science)

Abstract:

The Lunar Reconnaissance Orbiter (LRO) was launched in 2009 with the goal of exciting interest in our pursuit of returning to the Moon. The Lunar Orbiter Laser Altimeter (LOLA) was an instrument onboard LRO that provided new topographic data globally across the lunar surface. In this research, we analyzed LOLA data in the South Pole-Aitken (SPA) Basin, the largest impact structure on the Moon. We wanted to test if craters are shallower or deeper in SPA compared to elsewhere on the Moon, which would help reveal SPA’s geology. To do this, we analyzed 61 craters in SPA and 66 craters in a highlands region north of SPA. We utilized geospatial software called JMARS to extract 8 topographic profiles for each of the 127 craters. For each of these profiles, we measured the crater diameter, floor depth, and rim heights. We then created scatter plots for the two regions, including data for both simple craters (diameter <20 km) and complex craters (diameter >20 km), to show the distribution of diameter as a function of depth in SPA and the lunar highlands. Our preliminary conclusions are that craters in SPA are shallower than craters in the highlands region. These results imply that craters in SPA may be susceptible to geological surface processes such as volcanic infilling. Further research should analyze other highland and mare areas of the Moon with a high population of craters and assess the comparison.

Mentor(s):

Mike Sori (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 574
Presentation Time: Session 3: 2pm-3:30pm

Designing a High Affinity MiniBinder Protein Inhibitor for SARS-CoV-2 Using Foldit

Author(s):

Jackson Moss† (Science, Honors)

Abstract:

SARS-CoV-2 uses its Receptor Binding Motif (RBM) to bind to the ACE2 receptor on human cells to initiate its infection mechanism. Targeting this infection pathway is one of the predominant ways the scientific community is working towards treating this disease as well as others including influenza. Here the protein modeling software Foldit was used to design an inhibitory binder protein for SARS-CoV-2 that block its ability to bind to ACE2 and enter the cell. Foldit couples human 3D spatial skills and creative thinking with artificial intelligence into a singular platform capable of producing models of brand new synthetic proteins. The algorithms aim to find the lowest energy conformation for a given sequence of amino acids and the sequence itself is determined by the human experimenter based on relative location and structure within the protein. Foldit also contains protein stability evaluation metrics that helped guide the design of the proposed solution and confirm that the structure is stable. Within these stability metrics are calculations regarding the energy change for the protein from its unbound to bound state, surface area in contact with the target, and the number of polar atoms not engaged in favorable interactions like hydrogen bonds. This minibinder protein offers a candidate for a solution to stop SARS-CoV-2 infection by providing Foldit's creators with a new amino acid sequence and proposed structure that can be tested in their laboratory.

Mentor(s):

Zahra Tehrani (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 575

Presentation Time: Session 3: 2pm-3:30pm

Dough rheological properties and baking characteristics of breads made from gluten-chickpea flour composites.

Author(s):

Yukina Murata† (Agriculture)

Abstract:

Pulse-incorporated products provide solution for protein-sourced malnutrition, protein alternatives, and agricultural sustainability. In this work, different concentrations of vital wheat gluten were added into chickpea flour to make 20:80, 30:70, 40:60 gluten-chickpea composite flours. These flours were then mixed into bread doughs and baked into bread loaves following the AACC official method (10.10B). To study the effect of fermentation, dough samples were taken out of the fermentation chamber at 0, 30, 60, and 90 minutes for rheological measurements. Amplitude sweeps found that longer fermentation time results in higher G’ and G’’ at the small amplitude oscillatory shear (SAOS) strain (<1%) across all samples studied. As the strain amplitude approaches the large amplitude oscillatory shear (LAOS) region, doughs fermented for more than 60 minutes showed faster structural decay compared to doughs fermented for less than 60 minutes. Additionally, samples with higher gluten content have lower G’ and G’’ in the SAOS region, whereas the reverse occurred in the LAOS region. This might be attributed to the energy absorption (“cushioning effect”) by the gas bubbles produced from fermentation at small strains. Up to a large enough strain, the bubbles collapsed and no longer provide the cushioning effect. After baked, the samples with higher gluten content had higher loaf volumes, lower hardness, and gas bubble counts as determined by texture profile and crumb image analysis. This study demonstrates the potential of the protein-enriched bread products made from gluten-pulse flour composites to address nutritional needs.

Mentor(s):

Jozef Kokini (Agriculture); Anh Minh Le (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 576
Presentation Time: Session 3: 2pm-3:30pm

AFTx05 PCB Design

Author(s):

Minh Nguyen† (Engineering); Rauf Erkiletlioglu‡ (Engineering); Vijay Tummalapenta‡ (Engineering)

Abstract:

AFTx05 was the fifth computer chip taped out by the VIP SoCET team in Spring 2020 semester with expanded functions such as Machine Learning Sparsity Optimizations and polymorphic logic test; however, the design of the testing PCB for hardware integration on the applications of AFTx05 has been in progress until now. Specifically, according to Spring 2022 AFTx05 PCB team, the design testing board was not completed mainly since the old FPGA MAX10 by Intel needs to be replaced with another market-available FPGA. Therefore, the purpose of the AFTx05 Spring 2023 is to continue and complete the design from last year including implementing new FPGA and improving subsystems. For methods, the project is mostly designed on KiCad 6.0 based on the AFTx05 chip documentation and past semester project designs. Moreover, the scope of the project focuses on implementing a new FPGA in replacement of the Intel MAX10, reorganizing or improving subsystems (power supply, current sensor, GPIO, memory interface, and daughtercard), and completing the final PCB design layout on KiCad.

Mentor(s):

Mark Johnson (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 577
Presentation Time: Session 3: 2pm-3:30pm

Exploring the Interaction of Race and Agreeableness in Helping

Author(s):

Chinelo Nnatubeugo† (HHS, Honors); Claire Kinder* (Science); Lily Snyder* (HHS); Faith McPhee* (Science)

Abstract:

Factors that influence helping behavior have been looked at in the past in order to discover who helps in certain situations. Past research has found that those higher in agreeableness are more likely to help (Habashi et al., 2016) and that individuals are more likely to help those in their ingroup (Sturmer et al., 2006). The purpose of this study is to look at the impact of race and personality on helping. White participants were asked whether they would be willing to help a purported student in need. Participants were asked to either perspective-take with the target or not. They were also led to believe the target was either black or white. Finally, agreeableness was measured. We predict that on average, those high in agreeableness will help more than those low in agreeableness. Helping will be greater on average in the perspective taking condition than in the observer condition. We predict that when the target is the same race as the participant, on average helping will be increased. We predict that when the target is the same race as the participant and they are high on agreeableness, the participant will help the target about the same in either the perspective-taking condition or the observer condition. However, when they are low in agreeableness, the participant will help the same-race target more in the perspective-taking condition than in the observer condition, but less on average compared to high agreeable participants. We predict that when the target is a different race from the participant and high on agreeableness, the participant will help the target about the same in either the perspective taking condition or the observer condition. However, when they are low in agreeableness, the participant will help the dissimilar-race target more in the perspective taking condition than in the observer condition, but less overall compared to high agreeable participants and compared to when the target is the same race as the participant. We predict that there will be no significant differences in helping between high and low agreeable participants in the perspective-taking condition when the target is the same race as the participant. However, we predict a significant difference between high and low agreeable participants in the perspective-taking condition when the target is of a different race than the participant. We are in the final stages of collecting data.

Mentor(s):

William Graziano (HHS); Regina Henares (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 578
Presentation Time: Session 3: 2pm-3:30pm

De novo protein design of a SARS-CoV-2 spike protein binder using the protein modeling software Foldit

Author(s):

Aidan Ocken† (Pharmacy, Honors)

Abstract:

The SARS-CoV-2 virus gains access into cells in the body by binding to the ACE-2 receptor and causing membrane fusion. Development of a spike protein binder to compete with ACE-2 receptor binding has the potential to provide an effective treatment in the early stages of infection. Currently, monoclonal antibodies used for treatment of SARS-CoV are not effective in treating early stages of acute SARS-CoV-2 infections. To address this problem, researchers have turned to protein modeling algorithms, such as Rosetta, to identify new protein structures. However, computer driven approaches have been limited by the vast number of permutations of protein sequences and deriving their lowest energy states. A more effective approach has been to crowdsource human creativity in combination with computer driven algorithms into a single platform using the citizen science game Foldit. Here we used Foldit to design a SARS-CoV-2 spike protein binder with higher predicted binding affinity for the receptor binding domain (RBD) than the ACE-2 receptor, based on the conceptual background of protein structure and folding. Thermodynamic favorability and stability were assessed based on three metrics that correlate with binding affinity: binding energy, contact surface area, and unsatisfied polar atoms. The next step for proposed binders would be protein synthesis and tests for structural accuracy and efficacy of neutralization. Successful SARS-CoV-2 spike protein binders, with the potential for intranasal administration, could greatly improve efficacy, speed, and cost of therapeutic treatment of the SARS-CoV-2 virus if they are shown to be viable in vivo.

Mentor(s):

Zahra Tehrani (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 579
Presentation Time: Session 3: 2pm-3:30pm

O'Keefe, C. and Vallier, S. "Using space-station sensors and in situ vegetation surveys with acoustic indices to reverse trends of species extinction rates for a NASA global biodiversity monitoring model."

Author(s):

Carli O'Keefe† (Engineering, Honors); Sydney Vallier† (Engineering, Honors)

Abstract:

Currently, global flora and fauna are facing mass decline and extinction due to the threats of climate change and urbanization. To monitor population changes, scientists are using sensors on the space station (DESIS, ECOSTRESS), satellites (MODIS, Landsat, ICESat 1/2), LiDar and drone imagery, acoustics, and in situ surveys. We aim to unify these data into a biodiversity framework to create a standardized method for monitoring global biodiversity. In this work, we will leverage over 4 million audio recordings from Purdue's Center for Global Soundscape to test phases of the model development using multivariate non-parametric statistical methods to implement temporal and spatial trend analysis. To do this, we will compare acoustic indices generated through Kaleidoscope (a commercial product), Python using scikit-madd package (an open source product), and R (an open source product) to determine the optimal method for calculating the acoustic indices. Then, we will create a novel visualization for a sensor-based habitat model using DESIS (hyperspectral camera detects changes in conditions of forests and agricultural land), ECOSTRESS (radiometer that measures temperature of plants), and optimized acoustic data (measures animal richness). This work contributes to the larger project goal of filling a gap in the understanding of the dynamics of landscapes, animal presence, and activities over time by developing phenology models for plants and animals at major terrestrial biomes on Earth.

Mentor(s):

Kristen Bellisario (Honors); Bryan Pijanowski (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 580
Presentation Time: Session 3: 2pm-3:30pm

Are findings of greater non-career-related life goals and lower desirability of career advancement among women explained by experiences of workplace discrimination? A response to Gino, Wilmuth, & Brooks (2015, PNAS)

Author(s):

Ronald Or† (HHS)

Abstract:

Women are underrepresented in senior-level professional positions, despite comprising nearly half of the total U.S. workforce. Past researchers have argued that these disparities are partially explained by gender differences in the extent to which women and men value professional advancement. These scholars show that, compared to men, women have more non-career-related life goals and view professional advancement as less desirable because it conflicts with other life goals. We argue that existing research did not adequately investigate mechanisms underlying this gender difference. The current project examines whether experiences of gender discrimination in the workplace influence women's life goals identification and professional advancement aspirations. We expect that when professional women are asked to recall experiences of discrimination, they will report increased non-career-related life goals and lower career aspirations, compared to those who are asked to describe general professional setbacks. Consistent with our hypotheses, our findings reveal that participants who described gender discrimination experiences, compared to those who described general setbacks at work, identified 1) greater proportions of non-career-related life goals and 2) prioritized family over work. These results shed light on alternative explanations, such as discrimination, for gender differences in values surrounding career advancement.

Mentor(s):

Erin Hennes (University of Missouri); Taeik Kim (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 581
Presentation Time: Session 3: 2pm-3:30pm

Understanding the Menstruation Health Needs of People Experiencing Homelessness during the COVID-19 Pandemic in Lafayette, Indiana

Author(s):

Emily Otten† (Science)

Abstract:

BACKGROUND: Period poverty occurs in all countries with limited access to menstruation products and other necessary resources. These conditions are amplified for menstruators experiencing homelessness, who faces significant barriers to supplies and hygienic spaces, while confronting menstrual stigma that magnifies the difficulties of managing menstruation.

OBJECTIVE: This study aimed to understand what people experiencing homelessness (PEH) know, experience, perceive, and practice when menstruating.

METHODS: In-depth interviews were conducted with 1) menstruators experiencing homelessness (n=12) and 2) community healthcare and social service providers (e.g., case managers, shelter directors, community health workers, nurses, n=12). Thematic analysis techniques were used for data analysis.

RESULTS: Menstruators experiencing homelessness navigated restrictive community resources with limited access to products, services, and spaces. While community healthcare and service providers offered some health education and connection to care, menstruators experienced complex interactions with these providers and the healthcare system, which is exacerbated by social stigma, limited healthcare access, and underlying chronic health conditions. The COVID-19 pandemic further magnified healthcare access barriers and disparities for menstruators experiencing homelessness as public spaces closed, economic conditions deteriorated, and health outcomes were poor among those most socioeconomically disadvantaged.

CONCLUSIONS: Findings from this study will advance reproductive and public health research by illuminating the disparities PEH face when managing menstruation in Indiana and contribute to the national dialogue on the importance of addressing these barriers. Our results bring attention to critical gaps at organizational and policy levels in menstruation management services to better integrate menstruation into health and wellbeing programs for PEH.

Mentor(s):

Andrea DeMaria (HHS); Rebecca Martinez (Liberal Arts); Natalia Rodriguez (HHS); Risa Cromer (Liberal Arts); Yumary Ruiz (HHS)

Poster Presentation Abstract Number: 582
Presentation Time: Session 3: 2pm-3:30pm

Environmental Testing and Computational Modeling of a Context Camera for the NASA Solar Cruiser Mission

Author(s):

Rhea Pahuja† (Engineering); João Pedro Bacchi† (Engineering); William Davis† (Engineering); Siya Deshpande† (Engineering); Trent Fatur† (Management); Emma Fisk† (Engineering); Thomas Greer† (Engineering); Justin Lin† (Engineering); Owen Lindner† (Engineering); Ian Veak† (Engineering)

Abstract:

Solar sails are an alternative form of propulsion that utilizes the radiation pressure produced by the reflection of a star's light off a large, thin, reflective sail. Purdue University students are developing a camera system that analyzes solar sail efficiency for the NASA Solar Cruiser Mission. To ensure the camera can handle the extreme conditions of space environments, a variety of physical tests and computer model analyses are being utilized. The thermal vacuum chamber (TVAC) testing sub-team is modifying a LyoStar freeze dryer to test our camera in extreme temperatures and pressures in accordance with NASA's General Environmental Verification Standards (GEVS). Another team is researching vibration testing analysis for the camera, with a current focus on testing procedures and simulated sine and random vibration testing in Solidworks, before considering actual physical testing. The team is also developing a thermal simulation with ThermalDesktop to model the radiation the camera will experience from the sun and Earth, as well as the conduction between internal components. The overall objective is to confirm the camera will be able to withstand the harsh environments of launch and orbit by using a combination of software and physical equipment testing.

Mentor(s):

Tony Cofer (Engineering); Alina Alexeenko (Engineering); Andrew Binder (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 583
Presentation Time: Session 3: 2pm-3:30pm

Synthesizing Metal Thiolates as Soluble Precursors for Multinary Sulfides

Author(s):

Isabel Panicker† (Engineering)

Abstract:

Multinary metal sulfides are an interesting class of materials many different properties. Of particular interest are the semiconducting metal sulfides which can be used for solar energy generation. While much research has been devoted to solution processing these materials when they contain late- and post-transition metals, but very little has been done for materials that contain alkaline earth metals. Solution-based approaches are desired because they can offer low energy, low cost, and scalable manufacturing processes. Therefore, this project focuses on creating a procedural basis for synthesizing multinary sulfides that contain alkaline earth metals (binary, tertiary and quaternary) with soluble metal thiolates precursors. The main procedure begins with a metal precursor that is reacted with a thiol in order to introduce a sulfur source. An appropriate solvent is selected, such as an amine, in order to form a precursor solution. Various metal precursors, thiols, and solvents are tested, ranging in polarity and size. If a metal thiolate solution is formed, then decomposition into the desired metal sulfide is performed by drop coating and heating the solution into films and then analyzing with XRD. Through this procedure, various multinary sulfides have been synthesized including Cu2BaSnS4 and the chalcogenide perovskite BaZrS3. This pathway opens up the possibility for widespread usage of multinary sulfides that contain alkaline earth metals in the fabrication of solar cells that can further sustainable energy goals.

Mentor(s):

Rakesh Agrawal (Engineering); Jonathan Turnley (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 584

Presentation Time: Session 3: 2pm-3:30pm

Affective response during and after the Progressive Aerobic Cardiovascular Endurance Run in individuals with different circadian rhythms and exercise preferences

Author(s):

Karina Paone† (HHS, Honors)

Abstract:

Exercise has been shown to have acute effects on how exercisers feel during and after exercise. However, it remains unknown how the exercise-induced affective responses may be influenced by individual difference factors such as preference for time to exercise or intensity of exercise. Therefore, the purpose of this study was to examine how individual differences in circadian rhythm and exercise preference may influence affective responses to a single bout of exercise. Sixty-six young adults aged 19-23 years completed the Morningness-Eveningness Questionnaire and Preference for and Tolerance of the Intensity of Exercise Questionnaire. To standardize the intensity of exercise, the Progressive Aerobic Cardiovascular Endurance Run (PACER) test that required participants to exercise until volitional exhaustion was used as an exercise stimulus. Affect was measured before, immediately after, 10-min after, and 20-min after the PACER test using a feeling scale from -5 to +5, with more positive values indicating more positive affect. The results showed more negative affect immediately and 10-min after the PACER test compared with before and 20-min after the PACER test while affect before and 20-min after PACER did not differ. However, such time-related changes in affect were not influenced by circadian rhythm, exercise preference, and exercise tolerance. The current findings suggest that circadian rhythm, exercise preference, and exercise tolerance do not have influences on the affective responses to acute exercise at the maximum intensity.

Mentor(s):

Shih-Chun Kao (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 585
Presentation Time: Session 3: 2pm-3:30pm

Determining the role of the epigenetic factors Gcn5 and Set1 in antifungal drug susceptibility and ergosterol gene expression in C. glabrata

Author(s):

Krishna Patel† (Agriculture, Honors); Payne Turney‡ (Agriculture)

Abstract:

Abstract Redacted.

Mentor(s):

Scott Briggs (Agriculture); Smriti Hoda (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 586
Presentation Time: Session 3: 2pm-3:30pm

Short-Term variability in speech symptoms associated with Parkinson disease.

Author(s):

Kaylee Patterson† (HHS, Honors); Brianna Coster‡ (HHS); Helen Willis‡ (HHS, Honors); Isabel Pati‡ (HHS)

Abstract:

People with Parkinson disease (PD) experience day-to-day fluctuations in symptoms. There are no short-term longitudinal studies that index variability in speech during a period where disease severity would not be expected to change. Short-term variability in common speech impairments experienced by people with PD could impact speech assessments and research outcome measures. We aim to examine changes in speech rate and intonation over the span of two sessions, separated by 1-2 weeks, in patients with PD. Using a novel telemedicine platform (Modality.AI), we have collected a national sample from people in the United States, including 60 people with PD and 31controls. Participants completed a standardized speech assessment at each session. Assessment tasks included an intonation task that elicited questions and statements using a contextual cue as well as reading a passage aloud. Measurements included speech rate, articulation rate, pausing patterns, and pitch range and variability. Data measurement is ongoing and will be complete by the end of March. Interclass correlation analyses will be conducted to determine how closely performance in session 1 correlates with performance in session 2. Data will be interpreted to identify metrics that are more likely to vary over the short-term and the impact to clinical practice for speech-language pathology.

Mentor(s):

Jessica Huber (HHS); Sandy Snyder (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 587
Presentation Time: Session 3: 2pm-3:30pm

Deterministic Embedding of a Cartesian Product within a Pegasus graph for Next-gen Quantum Annealing Machine

Author(s):

Viet Khoi Pham Khac† (Engineering)

Abstract:

In a quantum annealing machine, a type of quantum computer that is mainly developed by D-Wave Systems, its quantum processing unit (QPU) is a lattice of interconnected qubits. These qubits are connected via couplers, creating different topologies in different generations. However, due to manufacturing limitations, the qubits in these topologies are not fully connected, thus, limiting the computational power. Therefore, minor embedding methods must be developed to fully take advantage of quantum annealing machines. In this project, we focused on developing such embedding methods on the Pegasus topology that is available in Advantage QPUs. Specifically, we implemented a deterministic embedding of a Cartesian product of completely connected graphs. To make it easier to embed problems onto the QPUs, we break down the problem by starting with an existing embedding in the Chimera graph of the past QPUs and modifying it to fit the three-layer characteristic of the Pegasus graph. We then focus on connecting these repeated patterns to create a valid solution. This approach guarantees the minor embedding has a small variance in chain length that allows for a more easily performed optimization of annealing parameters that are typically dependent on chain length. Examples of such annealing parameters are anneal offsets, flux bias offsets, chain strength, and anneal pauses.

Mentor(s):

Andrew Wildridge (Science); Andreas Jung (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 588
Presentation Time: Session 3: 2pm-3:30pm

Characterization of proteins from the bacteriophage RiverMonster

Author(s):

Ashley Phoenix† (Science, Honors); Austin Lu* (Science)

Abstract:

Bacteriophages are viruses that infect bacteria. They inject their genetic material into bacterial cells, which is then replicated to produce new bacteriophages using the host's machinery. This process leads to lysis of the bacteria, where the newly synthesized phages are released into the environment to infect and kill additional bacteria cells. As they are a natural predator of bacteria and can co-evolve, bacteriophages serve as promising therapeutics, as their specificity allows them to target and kill select strains of pathogenic bacteria. One obstacle to using bacteriophages for therapeutics, however, is that not much is known about the vast number of bacteriophages in existence. To fill this knowledge gap, the objective of this project is to better understand how phages hijack and kill bacteria by characterizing the structure and function of proteins from the bacteriophage RiverMonster, which was discovered at Purdue University. The genes from RiverMonster were cloned and amplified using PCR and inserted into a plasmid for expression in bacteria. After expression, the proteins are purified, and structural characterization performed using size-exclusion chromatography, small-angle X-ray scattering, circular dichroism, computational modeling, X-ray crystallography, and/or electron microscopy. The structures of these proteins will offer clues about their function, which will be further investigated in future studies.

Mentor(s):

Nicholas Noinaj (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 589
Presentation Time: Session 3: 2pm-3:30pm

Simulating Realistic Patterns: Image Processing for Zebrafish

Author(s):

Kotekar Annapoorna Prabhu† (Engineering); Caroline Henson* (Engineering, Honors)

Abstract:

Zebrafish (Danio rerio) are small, striped fish that are widely used in biomedical research primarily due to their genetic similarity to humans and small size. The stripes on a zebrafish have different kinds of pigment cells, one of which is the melanophore. Melanophores are closely related to melanocytes in humans, which make them a valuable tool in studying melanoma. However, the small size of the zebrafish makes it challenging to observe pattern formation and development. The purpose of this research project is to develop post-processing software to create realistic zebrafish patterns using mathematical model data. The simulated patterns are constructed by sampling different pigment cells from a real zebrafish. To make the pattern look more realistic, each pigment cell on the simulated stripe is determined by taking into account the age of the fish as well as the distance of the pigment cell from the center of the pattern. We use a machine learning approach, in conjunction with the traditional software approach, to generate realistic zebrafish stripes using image-to-image translation. In particular, we train a conditional generative adversarial network (cGAN) on 450 pairs of simple plots of zebrafish patterns and their corresponding simulated pattern for many iterations. The trained cGAN model can then be used to generate realistic stripes using only plotted zebrafish patterns. This approach produces convincing images of zebrafish with mathematical model data and can be used to qualitatively analyze pattern formation in zebrafish.

Mentor(s):

Alexandria Volkening (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 590

Presentation Time: Session 3: 2pm-3:30pm

Realizaation of Ruthenium Trichloride Josephson Junction

Author(s):

Amit Rohan Rajapurohita† (Science)

Abstract:

alpha-RuCl3 has been under immense interest as a prime Kitaev quantum spin liquid (QSL) candidate which has implications in fault tolerant quantum computing. In spin liquids, the spins do not order at low temperatures, but can have interesting dynamics which provides us with the possibility of exotic quasi particles, Majorana fermions, which are topologically protected. Interestingly, quasiparticle excitation in superconductors have the same mathematical structure of the Majorana equation from their underlying particle hole symmetry. The perfect blend to observe their interaction is the Josephson Junction, two superconductors connected by a thin layer of QSL candidate material alpha-RuCl3. This study aims to further our understanding of this new phase of matter and realize its potential applications by exploring the experimental realizations and techniques involved in observing its interactions with electromagnetic fields and supercurrents. Performing this experiment involves two major steps, fabrication of the Josephson Junction and low-noise transport experiments in a cryogenic device to collect data at low temperatures where quasi-particles exist to study the coupling between the QSL and the superconductors. This study aims to talk about the various experimental methods used to measure these interactions.

Mentor(s):

Arnab Banerjee (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 591
Presentation Time: Session 3: 2pm-3:30pm

The effects of the COVID-19 vaccine on hormone levels across adolescence

Author(s):

Prudence Regacho† (Science, Honors)

Abstract:

Immunization is one of the most effective ways to prevent the contraction of the novel coronavirus disease (COVID-19), however, there is a lack of scientific evidence on the potential effects of the COVID-19 vaccine on changes in stress and reproductive hormones in boys and girls during puberty. To fill this gap, we leveraged data from 22 adolescents (Mean age=13, ~50% female) from the Early Growth and Development Study (Leve et al., 2019) who provided hair samples in Spring 2020 and ~9 months. later; 17 received the COVID-19 vaccine between assessments, 5 did not. Hair samples were assayed for cortisol (n=17), estradiol (n=8), and progesterone (n=14). The ANOVA models included sex, assessment, vaccination status, and the assessment*vaccination status interaction as predictors (there were no unvaccinated boys with estradiol/progesterone data, preventing interactions with sex). There were no effects for cortisol $F(7)=.79$, p>.05. Girls had higher progesterone than boys, $F(1)=2.48$, $p=.13$, partial-eta-squared=.11, though assessment and vaccinations had no effect. Finally, for estradiol there was an interaction of vaccination status and assessment, $F(1)=5.38$, $p=.04$, partial-eta-squared=.33: levels decreased for vaccinated adolescents, but increased for un-vaccinated adolescents (as would be expected during puberty). The decrease of estradiol in the vaccinated group suggests potential interference with puberty, since estradiol increases during puberty. Our results are preliminary due to the small sample size, and thus larger sample sizes are needed to confirm if there are interactions among COVID-19 vaccine, sex, and assessments on hormone levels.

Mentor(s):

Kristine Marceau (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 592
Presentation Time: Session 3: 2pm-3:30pm

What is the efficacy of using authentic equipment to improve STEM learning outcomes in a student-led recitation experience?

Author(s):

Kathleen Reyna† (HHS, Honors)

Abstract:

One of the many consequences of World War II was the manufactured insecticide dichlorodiphenyltrichloroethane (DDT). In 1972, DDT was banned by the U.S. Environmental Protection Agency due to its lasting environmental and health effects. This ban was influenced by Rachel Carson's novel Silent Spring and the environmental silence directly resulting from DDT use. The course, "Evolution of Ideas: Silence," aims to compare the actions of Carson to modern day activists and scientific methods for the research of an emerging new Silent Spring, or sixth mass extinction, using authentic equipment in student-led recitation experiences. The goal of this study is to see if intrinsic motivation can be developed in a first-year interdisciplinary course by using authentic equipment in a flipped classroom. To do this, a mentor researcher observed students participating in five student-led recitation activities that used authentic equipment (i.e.., synth bits, spectrum viewer, and decibel meter). Using a ranking system provided by the instructor (KB), we compared the two highly ranked recitation activities using an unstructured machine learning algorithm for topic analysis compiled from narratives from an objective observer (KT) and reflective narratives provided to the instructor (KB) by the students. We predict that students who interact on an individual level with the authentic equipment, utilizing the idea of intrinsic motivation, have a higher engagement with the material and its real-world applications.

Mentor(s):

Kristen Bellisario (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 593
Presentation Time: Session 3: 2pm-3:30pm

Speech Production Variability and Phonological Awareness in Preschool-Age Children

Author(s):

Claire Richert† (HHS); Nicole Milharcic† (HHS)

Abstract:

Children with speech sound disorders (SSD) are less intelligible than other children of the same age as they produce more speech sound errors. The largest proportion of children with SSD present with a phonological SSD, as opposed to a motor speech disorder, or residual speech errors (Waring & Knight, 2013). Children with phonological disorders typically have co-occurring speech production errors and phonological processing deficits. The exact nature of the relationship between speech errors and phonological processing is not yet understood, as cognitive-linguistic factors such as vocabulary size (e.g., Rvachew, 2007) and environmental factors such as maternal education (Younger et al., 2019) or home literacy practices (e.g., Hood et al., 2008) influence phonological processing skills in young children.

The goal of the study was to investigate the relationship between types of speech errors, speech production variability, and speech perception in preschoolers with and without speech sound disorders. A total of 40 children ages 4 and 5 years completed the study, 20 with typical speech and language development, and 20 with speech sound disorders. Groups were matched on gender, age, maternal education, receptive and expressive vocabulary, nonverbal intelligence, and expressive morphosyntax. Multiple regression was used to identify the best fit model for the relationship between vocabulary, speech errors, and phonological awareness.

Mentor(s):

Françoise Brosseau-Lapré (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 594
Presentation Time: Session 3: 2pm-3:30pm

Project Title: Tumor-associated antigen surface density in mechanisms of CAR T cell threshold setting

Author(s):

Kenneth Rodriguez-Lopez† (Science); Tanvi Breinig* (Science, Honors)

Abstract:

Engineered chimeric antigen receptor (CAR) expressing T Cells are anti-tumor therapies that allow for the repurposing of the targeting abilities of these adaptive immune cells. These have proven useful against blood cancers but the translation to successful solid tumor eradication has largely failed due to toxicities from the therapies. We are researching the effects tumor-associated antigen (TAA) density has in CAR T cell therapy efficacy by interrogating the CAR T cell activation thresholds so that receptor design can be improved, and more tolerable therapeutic regimens can be adopted. One common TAA that tends to be overexpressed in solid tumors like ovarian, breast, lung, pancreatic, and kidney cancers, is the folate receptor (FOLR1). In these tumors the expression of such receptors is heterogenous as the disease progresses. This expression heterogeneity can potentially lead to recurrence of cancer after initial treatment by selecting for cells with lower TAA expression that do not trigger CAR T cell response. Developing clonal cancer populations that differ in expression level of FOLR1 is therefore crucial for studying cancer-CAR T cell interactions moving forward. To achieve this MDA-MB-231 metastatic breast cancer clonal populations were developed. FOLR1 density was quantified using fluorescent microscopy (TIRF & EPI), as well as flow cytometry. Cell-cell killing assays with CAR T cells were then done to determine induced cell death as a function of FOLR1 density in the tumor cells. This, in tandem with in vitro reconstitution-based assays allows us to map the numbers and characteristics of CAR-FOLR1 binding events to T cell activation. We are generating a more complete understanding of CAR-tumor cell interactions in order to give insight on how to better modify CAR T cells for more effective cancer immunotherapies.

Mentor(s):

Shalini Low-Nam (Science); Kevin Scrudders (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 595
Presentation Time: Session 3: 2pm-3:30pm

Design of a Novel Binder Incorporating ACE2 Helix for SARS-CoV-2

Author(s):

Saaniya Rupani† (Engineering, Honors)

Abstract:

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a variant of the coronavirus that is structurally similar to SARS-CoV. The virus's mechanism of infection involves the receptor binding domain (RBD) of the spike protein interacting with the human cell receptor of the angiotensin-converting enzyme (ACE2). This contact leads to membrane fusion and infection of the virus to the host cell. Current therapies like antibodies are often too large for targeted delivery, are expensive to produce, and have a short shelf life. Therefore, there is a need for quick development of small binder proteins to block interactions between the spike protein and ACE2, which can be used in therapeutics for treatments against SARS-CoV-2. Many computational algorithms are used to design current de novo proteins; however, due to the exponential number of possible amino acid sequences and confirmations, computational methods alone are not feasible. A new software, Foldit, incorporates citizen scientists and human creativity along with AI to facilitate the development of new binder proteins that are effective against SARS-CoV-2. This project involves the design and adaptation of a mini binder protein that successfully folds and binds to the RBD of the spike protein. This alpha helix bundle protein will be evaluated for stability and binding affinity using several metrics: DDG (change in binding energy), SASA (solvent-accessible surface area), and BUNS (buried unsatisfied polar groups). This proposed protein has the potential to be experimentally tested by scientists at the Institute for Protein Design for treatment of SARS-CoV-2.

Mentor(s):

Zahra Tehrani (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 596
Presentation Time: Session 3: 2pm-3:30pm

Semiconductors Supply Chain: the Current Status, Challenges, and Suggestions for Promoting Semiconductor Manufacturing in the US

Author(s):

Nemisa Samanthapudi† (Engineering)

Abstract:

The United States (US) has planned for domestic production of semiconductors to avoid future challenges and disruptions in the supply chain caused by heavily relying on facilities located in Taiwan, China, and Korea where most of the production currently takes place. To promote semiconductor manufacturing, the US government passed the CHIPS Act of 2022. The act is a step forward for the nation to be independent from overseas semiconductor manufacturing. Proposals are still being made considering the requirements and the capacity of the nation in this area. However, there is a lack of systematic summary regarding the current status of the semiconductors supply chain and the challenges for promoting manufacturing in the US.

This research bridges the gaps by examining the five key phases of the semiconductor supply chain: design, semiconductor tools and equipment, materials, front-end and back-end manufacturing, and ATP (assembly, test, and packaging). Findings from this research suggest the US focus on making investments towards research, human resource development, and industry partnerships, specifically in the areas of semiconductor tools and equipment, front-end and back-end manufacturing, and ATP. Such actions will facilitate innovation and provide stronger access to a variety of resources and funding, and assist with tackling the complexities behind each challenge. Domestic semiconductor production can enhance technological leadership, drive economic growth, and create job opportunities.

Mentor(s):

Tho Le (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 597

Presentation Time: Session 3: 2pm-3:30pm

Automated Segmentation of Murine 4D Ultrasound Cardiac Images using a Deep Learning Convolutional Neural Network

Author(s):

Abhiram Saridena† (Engineering)

Abstract:

Preclinical rodent models of cardiac disease are pivotal for understanding and characterizing heart disease for targeted therapy. 4D (3D+time) ultrasound is a promising imaging technique that can be used to track cardiac pathology non-invasively, but manual analysis of 4D images is time consuming. Automated machine learning techniques that utilize deep convolutional neural networks (CNNs) provide a unique opportunity to leverage the value of 4D imaging while streamlining analysis and processing. Our current approach utilizes a CNN for automatic segmentation of the 4D images with a Dice score of 0.85. Our research aim is to improve the accuracy of the automated segmentation of 4D images. Using the open-source tool Ray Tune (PyTorch, Warsaw, Poland) we will perform hyperparameter tuning for our deep learning model to improve our performance. Our hyperparameter search space includes the learning rate, batch size, and momentum. To validate our model, we will then use a 5-fold cross-validation on the dataset and compare the results using the default and optimized hyperparameters. In addition, we will also implement data augmentation techniques by applying spatial transforms to our imaging data. We hypothesize that by tuning our hyperparameters and implementing data augmentation techniques our model accuracy will improve as measured by a Dice score equal to or greater than 0.95.

Mentor(s):

Craig Goergen (Engineering); Conner Earl (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 598
Presentation Time: Session 3: 2pm-3:30pm

Design of a SARS-CoV-2 Protein Inhibitor

Author(s):

Diana Marie Sarrico† (Engineering, Honors)

Abstract:

Throughout the COVID-19 pandemic, there has been a need for therapeutics that can effectively limit the spread of infection. This research presents a new drug candidate against SARS-CoV-2, the virus causing COVID-19. The SARS-CoV-2 virus infects cells via binding of its spike protein receptor-binding domain (RBD) to the ACE2 human cell receptor. Previous research has indicated that stable binder proteins with high affinity can successfully neutralize the virus. However, current options are limited to large monoclonal antibodies that are complex to manufacture and unstable. The objective is to use Foldit - a public software combining computer algorithms and human creativity - to synthetically design a small protein with high binding affinity and stability. The predicted stability and binding strength of the design is evaluated using Rosetta Energy units, binding interface surface area, unsatisfied polar atom quantification, and binding energy. The final protein incorporates a helix bundle to create a compact structure, a plethora of hydrogen and noncovalent bonds to the RBD which increase bonding strength (affinity), and a shorter chain length. Future development would involve expressing this protein in the lab in order to analyze its atomic structure and experimentally test its neutralization of the SARS-CoV-2 virus. This research represents the power of citizen science in synthetic protein design, as well as a promising protein inhibitor that can attack COVID-19 infection at early stages.

Mentor(s):

Zahra Tehrani (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 599
Presentation Time: Session 3: 2pm-3:30pm

The Process of Scientific Inquiry: Views of Biology Educators and Students on Hypotheses and Predictions.

Author(s):

Nandhitaa Satyanarayanan† (Science, Honors)

Abstract:

The process of scientific inquiry is the backbone of research in scientific fields, including biology. This foundational knowledge is integral for generating findings and experiments. However, there is evidence that shows undergraduate students struggle with some components of the process, specifically the concepts of predictions and hypotheses. The differences in definitions between biology professors may be one factor, as students may not learn standardized definitions of what hypotheses and predictions are and how to make them. In this specific project, we are investigating how biology undergraduate students characterize their own and their peers' understanding of the concepts of hypotheses and predictions, potential challenges in comprehension, and if they think that it's important for everyone to have a standardized view on these topics. For biology instructors, we are studying how they view their students' understanding of these concepts and how they implement teaching of predictions and hypotheses. We conducted semi-structured interviews with biology students and educators. Interviews were transcribed and analyzed using thematic qualitative coding. We developed a codebook that summarized what participants were saying into a short word/phrase that encompassed the essence of their statements. Our preliminary findings showed that instructors describe the difference in their understanding versus their colleagues' in terms of disciplinary specialization. Both instructors and students also identified training/research exposure as the main factor in determining student competence with these concepts. These findings are presented within the context of a broader project goal of characterizing participants' overall conceptions of scientific hypotheses and predictions.

Mentor(s):

Stephanie Gardner (Science); Anupriya Karippadath (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 600
Presentation Time: Session 3: 2pm-3:30pm

The effect of prepregnancy circadian disruption and obesity on lactation efficiency in mice

Author(s):

Jenna Schoonmaker† (Agriculture, Honors)

Abstract:

Metabolic changes occur in females to support offspring development during pregnancy and lactation. Number of cells and their metabolic activity determine milk production by the mammary gland. We hypothesized that maternal prepregnancy obesity and exposure to continuous light may affect these variables. Our study aimed to investigate the effects of continuous light exposure and prepregnancy diet-induced obesity on the ATP concentration in lactating mouse mammary glands, mitochondria number, and activity of the mitochondrial enzyme succinate dehydrogenase (SDH) and relate them to litter weight. The study followed a 2X3 factorial design, with mice assigned to high-fat (HF) or control (CON) diet and 12 hours of light/12 hours of dark (LD), continuous light at 5 lux (L5), or 100 lux (L100). On postnatal day 12, litters of HF dams weighed more than CON (P<0.05), and continuous light tended to increase litter weight (P=0.07). Mitochondrial to chromosomal DNA ratio measured with RTqPCR analysis was not affected by diet or light, indicating no differences in number of mitochondria per cell. SDH staining was not affected by diet or light, but ATP concentration was lower in L5 and L100 than LD mice (P<0.001). Mammary weight of L100 animals was greater than LD (P<0.05). The negative relationship between mammary size and ATP concentration illustrates that nutritional and environmental exposures affect how the tissue supports lactation. Continuous light increases mammary size, which in smaller LD mammary glands is compensated partly by greater mammary ATP production.

Mentor(s):

Theresa Casey (Agriculture); Kelsey Teeple (Agriculture); Prabha Rajput (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 601
Presentation Time: Session 3: 2pm-3:30pm

Implementing a Campus-Wide Vaccine Clinic Through Interdisciplinary and Community Partnerships

Author(s):

Sathveka Sembian† (Engineering); Olivia Carlson† (HHS)

Abstract:

Abstract Redacted.

Mentor(s):

Andrea DeMaria (HHS); Katherine Head (Indiana University Purdue University Indianapolis); Trexie Rudd (Pharmacy); Monica Kasting (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 602

Presentation Time: Session 3: 2pm-3:30pm

The Effects of in vitro CAND1 Expression on Protein Ubiquitination

Author(s):

Neha Shah† (Agriculture)

Abstract:

As cancers and neurodegenerative diseases such as Huntingtons, Parkinsons, and Alzheimers, become more prevalent, understanding protein degradation, something they all have in common, is essential as the basis for future studies involving treatment. The overarching goal of this research is to observe how proteins are selected, or ‘tagged’ for degradation, a process called ubiquitination. Cullin-RING ubiquitin ligases are the enzymes involved in the last step of ubiquitination. They are, in part, regulated by a gene called CAND1. In this project, we aim to express this gene in vitro, and observe its role in mediating ubiquitination. To begin, we inserted the C-terminus half of our given CAND1 gene fragment into our pGEX plasmid. This was done using PCR to amplify the fragment, and followed with an enzymatic double digestion to cut the plasmid and fragment so that they would be compatible. Then, we conducted a ligation reaction to insert the fragment into the plasmid, creating Cr-CAND1-CTD. SURE2 E.coli cells were transformed to contain Cr-CAND1-CTD, and the transformation was shown to be successful via gel results from our confirmation double digestion. At this point, we have inserted half of the CAND1 gene (the C-terminus end) into the plasmid, and are working on inserting the second half of the gene (N-terminus end). Once the project is complete, we will use our CAND1-containing E.coli cells for protein expression and further assays on their interactions. We hope that this work will create clarity around ubiquitination, leading to further meaningful studies and disease treatments.

Mentor(s):

Xing Liu (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 603
Presentation Time: Session 3: 2pm-3:30pm

Semi-Supervised Neural Processing and Clustering of Long-form Ecological Sound Data

Author(s):

Anurag Shah† (Liberal Arts, Science, Honors); Ziyang Huang* (Science); Tzu-wen Hsu* (Science); Alex Liu* (Science); Bai Li* (Science); Yohan Berg* (Science); Eli Coltin* (Science, Management)

Abstract:

Many communities have sites of considerable ecological value on a local scale, such as West Lafayette's Celery Bog, but are not a feasible option for ecologists to analyze due to their lack of size or funding. However, changing climates increasingly necessitates such analysis for these communities; therefore, we would like to use long-form sound recordings as a basis to carry out computational analysis. Semi-supervised learning techniques have been applied extensively to image domains, and are also useful in this scenario as they allow for clustering sounds, allowing for a solution that is agnostic to the actual wildlife present. In this paper, we present an architecture based on the Vector Quantized Variational Autoencoder (VQ-VAE). This model will use the PaDiM (Patch Distribution Modelling) Anomaly Detection method to identify sound frames with sounds outside of background noise by identifying anomalies in input spectrograms. Using these anomalous sound frames as input for the VQ-VAE, the model will use its codebook of vectors to cluster input sounds.

Mentor(s):

Gustavo Rodriguez-Rivera (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 604

Presentation Time: Session 3: 2pm-3:30pm

The Effect of Colostrum Intake on 24 h Circulating Levels of Serum Protein and Amino Acids

Author(s):

Emma Shelton† (Agriculture); Corrin Davis* (Agriculture, Honors)

Abstract:

Colostrum is the first milk available to neonates and has a high concentration of nutrients and bioactive factors. The level of colostrum consumed links to long-term growth and fertility of swine and humans, however, the mechanism of programming is currently not known. We hypothesized that colostrum increases the availability of branched-chain amino acids (BCAA), which activate mTOR to promote protein synthesis and the proliferation of cells. Our objective was to compare the level of circulating proteins and amino acids between piglets fed differing levels of colostrum and milk replacer formula. Female piglets were assigned at birth to 1 of 6 treatments and fed to intake colostrum at 20% (COL20; n=9) or 10% (COL10; n=10) or pair-fed milk replacer at 20% (PF20; n=9) or 10% (PF10; n=10) of birth body weight by administering equal doses every 2 h over 24 h. A positive control group of gilts stayed on sow (SOS; n=9) to suckle. Animals were euthanized 2 h after the last bottle feeding; although the negative control group (zero hr; n=8) was euthanized immediately after birth. Blood was taken by cardiac puncture, and serum was prepared and stored at -80 C until analysis. Protein concentration was measured using a BCA assay. The amount of circulating amino acids was measured using liquid chromatography-tandem mass spectrophotometry (LC-MS/MS). Data collection and analysis are ongoing, but initial findings indicate that COL20 and SOS animals have higher circulating levels of protein and BCAA than all other treatments.

Mentor(s):

Theresa Casey (Agriculture); KaLynn Harlow (Agriculture); Linda Beckett (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 605
Presentation Time: Session 3: 2pm-3:30pm

Determining the binding interaction between PLCe and RhoA

Author(s):

Siddhi Shetty† (Science)

Abstract:

Phospholipase Ce (PLCe) enzymes hydrolyze phosphatidylinositol (PI) lipids to produce secondary messengers that increase intracellular calcium and activate protein kinase C. Since PLCe is central to a number of cell-signaling pathways, including proliferation and survival, its regulation is critical. One of the best characterized PLCe activators is the small GTPase RhoA. The region of PLCe that binds to RhoA is unknown, but is known to be within the catalytic core of the enzyme. The goal of my research project is to optimize a luminescence-based assay used to monitor the interactions between RhoA and PLCe in live cells. This NanoLuciferase assay uses the enzyme luciferase which glows on the addition of its substrate furimazine. In this assay, the luciferase is divided into two parts: a small bit (SmBiT) and a large bit (LgBiT). The N-terminus of PLCe is tagged with SmBiT and the N-terminus of RhoA is tagged with LgBiT. Upon RhoA and PLCe interactions in the cell, the luciferase enzyme is reformed, and the luminescent signal is produced. To study the binding interactions between PLCe and RhoA, I have made truncations and deletions in the PLCe structure. By deleting specific regions of the enzyme the NanoLuciferase assay is used to determine which domains are required for RhoA binding.

Mentor(s):

Angeline Lyon (Science); Ketaki Mahurkar (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 606
Presentation Time: Session 3: 2pm-3:30pm

Characterizing the anti-proliferative and anti-migratory effects of Neocarzilin A and its derivatives in Angiosarcoma.

Author(s):

Mae Shu† (Science); Emma Terwilliger* (Science); Lauren Gartenhaus* (Science)

Abstract:

Angiosarcoma (AS) is a rare and aggressive endothelial cell cancer with a 5-year survival rate of 30-40%. Due to rising cases of AS and limited knowledge of its spontaneous drivers, research is necessary to uncover its mechanisms. The conditional deletion of Dicer1 has shown AS in endothelial cells and DICER1 is crucial for canonical microRNA (miRNA) biogenesis, indicating that miRNAs may have a role in AS progression. In previous studies, miR-497 was significantly down-regulated in a variety of tumors compared to normal tissue, including AS. Therefore, we aim to determine the key target genes that miR-497 may regulate in AS. Our lab has validated that miR-497 targets Vat1, which is also upregulated in patient tumors. The Vat1 gene codes for a vesicle amine transport protein that aids cell migration and has been shown as a pathogenic factor in many tumors. Another study reported that Neocarzilin A (NCA), an anticancer natural product, irreversibly binds to VAT1, thereby inhibiting its function. NCA was shown to inhibit cell viability and migration in a panel of cancer cell lines, however, its effect in AS cell lines was unknown. Therefore, we hypothesized that NCA would inhibit cell viability and migration in AS cell lines. We have found that AS cell lines are more sensitive to NCA than normal endothelial cell lines, and that NCA inhibits cell migration in AS cell lines. Future studies will focus on testing other derivatives of NCA, which may be more potent than the parental NCA compound.

Mentor(s):

Jason Hanna (Science); Annaleigh Powell (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 607
Presentation Time: Session 3: 2pm-3:30pm

Predicting neurogenetic risk in infancy using early vocal development and sex

Author(s):

Rachel Siela† (HHS, Honors); Laurel Williams† (HHS); Kaylee Bobay† (HHS); Conghao Gao† (HHS); Deeksha Handa† (HHS); Madison Chin† (HHS); Athena Fordwor‡ (HHS); Victoria Tuell‡ (HHS, Honors); Grace Strabala‡ (HHS); Erin Lee* (HHS); Olivia Battaglia* (HHS); Tiernan McDivitt* (HHS); Alyssa Cregg* (HHS)

Abstract:

Extant literature documents a higher rate of language/speech disorders in males, however, despite sex being a risk factor, we do not know what role it plays in early vocal behavior of infants at high risk for such disorders. The purpose of this study was to ask: 1) Do high-risk infants demonstrate atypical vocal development patterns? and 2) Is the quality and quantity of early babble distinct for male and female infants, and does this interact with risk? To answer these questions, we examined the canonical babbling ratio (CBR; the ratio of canonical syllables (those with a consonant and vowel, like "ba") to all babbled syllables) and number of babbled syllables in data collected from 89 high- and low-risk 6-18-month-olds. The infants were divided into four groups: infants with Angelman, Down, and Fragile X Syndrome, and infants at low risk for speech and language disorders. Each participant was recorded for one day using the Language ENvironment Analysis Digital Language Processor. After recording, speech produced by the infant was extracted and annotated by 3 trained undergraduate coders for the number of canonical and other syllables produced. We ran ANOVAs to explore group and sex differences, which revealed a main effect of risk group, but no main effects or interactions of sex for our dependent variables (number of syllables, CBR). Thus, results revealed group differences, but not effects of sex suggesting that sex does not relate to risk in vocal production which could contribute to improve early diagnosis of speech and language disorders.

Mentor(s):

Amanda Seidl (HHS); Bridgette Kelleher (HHS); Erica Hill (HHS); Laraib Kausar (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 608
Presentation Time: Session 3: 2pm-3:30pm

Investigating Membrane Proteins in Mycobacterium Phage PurduePete Using Bioinformatics Software

Author(s):

Julia Simler† (Engineering); Garret Manquen† (Engineering)

Abstract:

Bacteriophages are highly abundant organisms that infect and kill bacteria without causing harm to other organisms. Their high specificity opens the door for a wide range of applications in biotechnology, including finding solutions to antibiotic resistance with phage therapy. To investigate ways in which these organisms can be used on a large scale, further research is needed. This project investigates putative membrane proteins in PurduePete, a C1 cluster Mycobacterium phage isolated, annotated, and characterized at Purdue University. Due to the lack of information regarding membrane proteins, it is of interest to explore the relationship between structure and function in these proteins. Recent advances in bioinformatics have led to increased opportunities for in-depth protein characterization and visualization. One such advancement is the transmembrane prediction program DeepTMHMM which was used to identify membrane proteins in PurduePete with one or more transmembrane regions within the protein sequence. The protein sequence of each membrane protein was then modeled using the structure prediction program AlphaFold2. The model results were visualized in PyMOL where the previously identified transmembrane regions were analyzed based on factors such as structure and hydrophobicity. The overall results of each membrane protein were compared to determine similarities and differences regarding the function of membrane proteins in C1 phages such as PurduePete. These conclusions will allow for further insight into the use of phage to effectively infect bacteria which will ultimately drive future advancements in the field of biotechnology.

Mentor(s):

Kari Clase (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 609
Presentation Time: Session 3: 2pm-3:30pm

Characterizing the contribution of histone variant H2A.Z to the promotion of H3K27me3 in Arabidopsis thaliana

Author(s):

Shelby Sliger† (Agriculture, Honors)

Abstract:

Abstract Redacted.

Mentor(s):

Joe Ogas (Agriculture); Jiaxin Long (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 610
Presentation Time: Session 3: 2pm-3:30pm

Multifunctional Composite Structures for Future Particle Accelerator Detectors

Author(s):

Pedro Daniel Soto Rodriguez† (Engineering, Honors); Cameron Hartsfield† (Engineering)

Abstract:

Authors: Pedro D. Soto Rodriguez, Cameron J. Hartsfield, Andreas Jung, Eduardo Barocio

This work focuses on the challenges posed on high energy physics detectors by future particle accelerators and on the support structures in the innermost regions of these detectors. These support structures require minimal mass and sufficient thermal conductivity to remove excess heat from onboard sensor electronics without sacrificing their physical integrity. Hence, a multifunctional composite structure that incorporates cooling while providing stiffness and strength can provide a solution to these challenges. Manufacturing of the multifunctional structure involves a manufacturing process of 3D printing highly thermally conductive continuous carbon fiber preforms and compression molding them with integrated cooling channels. Benefits to this approach include the ability to optimize the design and orientation of the continuous fiber in the preforms to best conduct the heat away from the sensors and into the cooling channels. To demonstrate the proposed manufacturing process, a representative geometry was manufactured and evaluated for consolidation and thermal management. The design and location of the continuous fiber preforms was driven by heat transfer analyses of the structure subjected to the heat flow generated by a representative sensor. The stiffness and strength characteristics of the structure under bending were characterized experimentally. Similarly, the consolidation of the different material forms integrated in the structure was verified through optical microscopy at multiple sections of the specimen. Finally, future work includes developing a setup for testing the thermal performance of the multifunctional structures as well as for characterizing the temperature gradients developed across the structure.

Mentor(s):

Eduardo Barocio (Purdue University); Andreas Jung (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 611
Presentation Time: Session 3: 2pm-3:30pm

Verification of SoCET Digital Library using Universal Verification Methodology

Author(s):

Pranav Srisankar† (Engineering); Duncan Van† (Engineering); Jason Choi† (Engineering); Wilson Wong† (Engineering)

Abstract:

Modern system-on-chips (SoCs) designed using hardware description languages often utilize libraries common throughout a chip's development. The System-on-Chip Extension Technologies (SoCET) team developed a multitude of modules in their digital library that will be used in future RISC-V SoCs. However, these designs are not simple to debug both due to the complexity of designs as well as the fact that SystemVerilog designs need to be simulated to be tested. To ensure that designs always work as expected, thorough verification of the designs is required. The current industry standard to verify modules is through the Universal Verification Methodology (UVM). UVM utilizes the object-oriented programming capabilities of SystemVerilog to verify designs, promoting code modularity and reusability across several projects. This project subteam has been generating UVM test benches to verify the counter, shift register, adder, and APB Requester/Completer modules in the digital library. Full verification of the digital library allows the SoCET team to be confident of the functionality of its designs and use them in future developments.

Mentor(s):

Mark Johnson (Engineering); Sarang Pramod (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 612
Presentation Time: Session 3: 2pm-3:30pm

The Role of the Gut Microbiome in the Regulation of Cartilage Extracellular Matrix Content

Author(s):

Aavya Srivastava† (Engineering)

Abstract:

The gut microbiome is a dynamic system that consists of microorganisms that inhabit the digestive tract and participate in many physiological processes across disparate organ systems. The gut microbiome modulates skeletal health, but a gap remains in our understanding of how it affects cartilage content. To investigate how the gut microbiome affects cartilage, we treated mice with four antibiotic treatments and collected distal humeri for digestion in trypsin and quantitative assessment of sulfated glycosaminoglycans (GAG) with Dimethylmethylene Blue (DMMB) blue assay. GAG content is directly related to cartilage's material properties and structure, because of this relationship . The mice used for the experiment were weaned at 21 days. The gut microbiomes were disrupted with one of four antibiotics when the mice were at five weeks: 0.5 g/L Vancomycin, 1g/L Ampicillin, 1g/L Metronidazole, or 1g/L Neomycin. The tissue was then harvested when the mice reached skeletal maturity. We collected forelimbs and isolated the distal humerus for DMMB assessment. The plate was read using 530 and 595 nm wavelengths for the full plate. The sulfated GAG content was then calculated by dividing the 530 nm values by the 595 nm values. The results of this study are still in preparation, but the results of this study will help establish the role of the gut microbiome on musculoskeletal tissue content and inform future studies on the role of the gut and musculoskeletal health.

Mentor(s):

Deva Chan (Engineering); Cameron Villarreal (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 613
Presentation Time: Session 3: 2pm-3:30pm

Acoustic biodiversity monitoring of functional road type impact in Tippecanoe County of two contrasting seasons using a non-invasive method

Author(s):

Alexis Starkey† (Agriculture, Honors); Ben Hausch† (Honors); Tejas Patel† (Engineering, Honors); Audrey Quinn‡ (HHS, Honors); Keely Dehn‡ (Science, Honors); Keaton Schroder‡ (Management, Honors); Josh Renzi‡ (HHS, Honors); Charles Degnan‡ (Engineering, Honors)

Abstract:

We are in the midst of a global crisis where species are becoming extinct at an alarming rate impacting biodiversity due in part to human disturbances. Many natural spaces are becoming fragmented due to increased urbanization, such as widening current roads and building new roads. Soundscape ecologists use non-invasive acoustic monitoring in many habitats to understand the changes in biodiversity and how roads may impact biodiversity. Acoustic indices are a known proxy for biodiversity estimates. Research has shown that anthropogenic pressures from road noise may negatively impact animals and affect bird species' reproductive rates. Multiple soundscape studies observe a relationship between anthropogenic noise and species richness, but more research needs to be conducted in Indiana on local and state roads. In this work, we deployed eight acoustic recording units with weather data loggers in Tippecanoe County parks with temperate forests between the Wabash River and a single road that changed functional type from local to a major collector. Sensors were located at set distances from the road (129.54m, 259.08m, and 304.8m) and river (304.8m and 609.6m). We hypothesize that biodiversity will decrease as functional type of road exhibits increased traffic flow. As Tippecanoe County continues to widen roads and build new roads, we aim for this research to help understand potential threats to our limited natural spaces and offer planners information for mitigation options.

Mentor(s):

Kristen Bellisario (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 614

Presentation Time: Session 3: 2pm-3:30pm

Dis/Misinformation Campaigns Negatively Impact Political Participation Amongst African Americans

Author(s):

Alicia Stevance† (Liberal Arts)

Abstract:

Information sharing affects our daily lives–how we view the world, interact with each other, and take political action. It has been studied and proven that dis/malinformation can be used to impact a person or group negatively, and specific communities have been targeted and victimized by this form of malinformation sharing. With that being said, minorities, in many aspects of life, including politics, have historically been disadvantaged in the United States. Research findings have established that marginalized communities are disproportionately targeted and victimized by dis/malinformation campaigns that attempt to reduce their political participation. Findings also establish direct and indirect links between political participation and dis/malinformation exposure. This project aims to identify how exposure to dis/malinformation influences voting participation or representation in politics amongst African Americans in the United States.

I take a two-step approach to delve deeper into this topic by:

a. Conducting a scoping review to assess the size and scope of available research literature and identify gaps in the current research

b. Conducting a case study that examines targeted dis/malinformation sharing during the 2016 United States Presidential Election

My research findings will be used to inform the development of a policy brief that documents strategies for combating the spread of dis/malinformation and improving political participation in African American communities.

Mentor(s):

Bethany McGowan (Libraries)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 615
Presentation Time: Session 3: 2pm-3:30pm

Image Processing and Analysis: Lane Detection

Author(s):

William Stevens† (Science); Xingyan (Ian) Li† (Science); Mykhailo (Misha) Tsysin† (Engineering)

Abstract:

With the prevalence of autonomous vehicles, the computer vision algorithms utilized for autonomous driving must be robust and accurate to assess road features through images captured in real time. In our previous work, we designed a multi-task neural network model according to the YOLO architecture and trained on the BDD100k dataset, to give detections and classifications of objects, as well as segmentations and classifications of lane lines, in an image. While last semester’s model was successful, there was room for improvement. So, we wanted to explore potential optimizations to the network to achieve better results. This process included the research, development, and testing of alternative strategies for the many components of our multi-task model. This will be achieved through modifying last semester's model according to the fourth edition of the YOLO architecture. The modifications to the model will include implementing an augmented feature extractor and an improved feature aggregation network through the works done in Cross-Stage Partial Networks and Path Aggregation Network. The feature extractor is designed to greatly reduce the number of duplicate gradient computations, and the improved feature aggregator prevents the significant loss of spatial information that occurred in our previous implementation, while still allowing the model to effectively merge shallow and deep information to achieve better predictions. These developments will allow our multi-task model to perform the three vision tasks for autonomous driving at a lower computation cost while also achieving higher accuracy, thus creating an improved version of the model for future work to build upon.

Mentor(s):

Edward Delp (Engineering); Carla Zoltowski (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 616
Presentation Time: Session 3: 2pm-3:30pm

Investigating the Impact of GrowLocal Lafayette and Food Finders Food Bank on Nutritional Health

Author(s):

Kaitlin Stone† (HHS, Honors); Galit Beraja† (Agriculture, HHS, Honors); Harris Collins† (Liberal Arts, Honors)

Abstract:

GrowLocal Lafayette is a community run organization in Lafayette, Indiana that is pioneering the "urban sharing garden." The urban sharing garden is a garden tended to by a central organization, GrowLocal, as opposed to the community. Members of the community may then freely benefit from the products in hopes of combating food deserts. Food Finders Food Bank is an organization based in North Central Indiana that distributes food products to those in need, with a similar intention of reducing food insecurity. Given the existing scholarly conversation on organizations such as these, it is likely that the presence of GrowLocal and Food Finders contributes to improved nutritional health of the community and a greater quality of life, as measured through Veenhoven's The Four Qualities of Life. Using qualitative and quantitative results from surveys and interviews, the current project elucidates the impact that these two organizations have on community members' nutritional health, specifically in terms of dietary choices and produce consumption. Preliminary data suggest that GrowLocal is not widely known by community members, but those who are aware of it believe that it contributes to greater produce consumption and nutritional health. Data also demonstrates that Food Finders allows residents to eat healthier by providing them increased accessibility to produce. Lastly, the majority of residents feel that they are experienced cooks and that home-cooked meals positively impact their health. Ultimately, collected data will inform the aforementioned organizations of their specific impact, and be applied toward the creation of a cookbook and cooking resources.

Mentor(s):

Jason Ware (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 617
Presentation Time: Session 3: 2pm-3:30pm

Optimizing Parameters for Network Burst Detection in hiPSC-derived Neuron Electrophysiological Recordings

Author(s):

Madeleine Strom† (HHS)

Abstract:

Human induced pluripotent stem cell (hiPSC)-derived neuronal cultures have become a promising tool for in-vitro disease modelling and drug testing. Micro-electrode array (MEA) technology contributes to this research in that we can measure the spontaneous neuronal network activity non-invasively, longitudinally and with high data content. Synchronized network bursts (NB) is a significant analytic parameter in MEA analysis , but exact detection settings have not been well established for this parameter in our system. In this study, we investigated which NB detection parameter settings would enable automated assessment to best represent true NBs (determined by manual assessment) while omitting weak and false detection of NBs . This is addressed through three separate parameters; the minimum number of active electrodes in a well, number of spikes participating in the NB, and percent of active electrodes that are required to participate in the NB. These settings can contribute to improving the accuracy of neurotoxicity, drug testing, and disease modelling studies that utilize hiPSC cortical cultures with a mixture of glutamatergic and GABAergic neurons and astrocytes .

Mentor(s):

Aaron Bowman (HHS); Anke Tukker (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 618
Presentation Time: Session 3: 2pm-3:30pm

Effect of Microstructure on Thermal Conductivity of Squeezed Thermal Interface Materials

Author(s):

Alina Stuleanu† (Engineering); Wyatt Gay* (Engineering); Hannah Gagelin* (Engineering); Aidan Crowley* (Engineering)

Abstract:

Thermal interface materials (TIMS) have been developed in order to aid in efficient heat conduction in electronic components, allowing heat sinks to conduct generated heat away from microprocessor chips and into the surroundings. Without TIMS, the dry contact area of solid-solid interfaces in electronics raises device temperature overall, diminishing performance and shortening the lifespan of microprocessor chips. The objective of this study is to determine the impacts of TIM particle distribution during the squeezing process on overall thermal conductivity. TIMs are fabricated from metal powders and polymer bases to form composites, then prepared through automated dot-dispensing and constant velocity squeezing procedures, and finally, cured with varying compression rates, forces, and TIM bond line thicknesses. After samples are prepared, thermal conductivity is measured as a function of squeezing parameters and thermal images are taken and compared to particle distributions using X-ray micro computed tomography (XRCT) imaging. Particle data and thermal images are then analyzed to model thermal properties as a function of particle data. The bond line thickness is expected to monotonically increase with the squeeze rate. The conductivity is expected to be highest at the slowest squeeze rate as the TIM particles will spread out more and likely form sheets of particles across a smaller bond line. The results of this study will determine the impact of TIM application methods on microstructure and thermal performance, allowing heat conduction in electronic components to be better optimized for the longevity and effectiveness of microprocessor chips.

Mentor(s):

Amy Marconnet (Engineering); Pranay Nagrani (Engineering); Ritwik Kulkarni (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 619
Presentation Time: Session 3: 2pm-3:30pm

The Dilution of Diversity: Ironic Effects of Broadening Diversity

Author(s):

Shannon Sturt† (Management)

Abstract:

Diversity is one of the buzzwords of the twenty-first century. But who counts as diverse? We coded diversity statements to examine how organizations typically define diversity and whether oppressed groups perceive some definitions as diluting diversity, or detracting from the original intention of diversity initiatives. Organizations most commonly opted for an individualistic definition of diversity (38%) that focused on diversity in perspectives and skills, with no mention of demographic group identities (e.g., race, gender; Study 1). In Studies 2-3, people of color perceived individualistic statements as diluting diversity more than other diversity statements. They were also less interested in working at those organizations, and individualistic statements led sexual minorities to be less willing to disclose their sexual identity (Study 4). Thus, broadening the definition of diversity to include individual characteristics and skills may backfire, unless the importance of demographic diversity is also acknowledged. In this presentation, the emphasis will be placed mostly on Study 1, however the new knowledge brought about by the other studies will also be discussed.

Mentor(s):

Teri Kirby (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 620
Presentation Time: Session 3: 2pm-3:30pm

DFT/VASP Calculations for Defective 2D Materials

Author(s):

Qiancheng Sun† (Engineering, Honors)

Abstract:

2D materials have been a major focus of recent studies because their unique structure results in exceptional energy transfer, superconductivity, and mechanical flexibility properties amongst many others. With the increased computational powers, many materials testing are being done computationally to save costs, but these simulations usually focus on ideal materials. However, materials almost never exist in ideal states because of the presence of defects. These defects are often neglected during simulations; as a result, the simulated results are always different from the actual material when it is physically produced. In the study, Density Functional Theory (DFT) and Vienna Ab initio Simulation Package (VASP) calculations are used to predict various properties of defective 2D materials and compare these calculated properties against those of ideal materials. Specifically, Geometry (POSCAR), K-mesh (KPOINTS), Input parameters (INCAR), and Pseudopotential (POTCAR) files are prepared containing the details of the selected material. Then a request is sent to the Brown supercomputer cluster at Purdue University where ENCUT convergence test, K-mesh convergence test, SIGMA convergence test, and geometry optimization are performed for this DFT (VASP) simulation. The specific materials of interest in this study includes graphene, phosphorene, hBN, and MoS2. The computed values of the defective materials will be compared with each respective ideal material and the differences will be analyzed to see if VASP can accurately compute the properties of defective 2D materials. It is expected that VASP will accurately compute defective 2D materials and prove to be a viable low-cost method for predicting material properties.

Mentor(s):

Tillmann Kubis (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 621

Presentation Time: Session 3: 2pm-3:30pm

Comparing effects of Atrazine Exposure on Neuroendocrine Molecular Targets at Two Developmental Exposure Periods in the zebrafish

Author(s):

Jenna Swihart† (HHS)

Abstract:

Atrazine is an herbicide commonly applied to control broadleaf and grassy weeds in agricultural regions of the US. Although its use was banned by the European Union in 2003 because of surface and groundwater contamination risk, the US EPA allows for a 3 ppb maximum contaminant level for drinking water. Atrazine is a known endocrine disrupting chemical with the potential to cause adverse effects at the hormonal and molecular level in neuroendocrine system pathways; however, the mechanism causing dysregulation following atrazine exposure has yet to be determined. In this study, hypothalamic and pituitary molecular targets were investigated to explain a mechanism for the negative endocrine axes impacts. Selection of gene targets was based upon common neuroendocrine hormones that have been reported in literature to be dysregulated following atrazine exposure in various models. Embryos were collected from adult wild type zebrafish and randomly assigned to 0, 0.3, 3, or 30 ppb (μg/L) atrazine treatment. For one timepoint, exposure began at 1 hour post fertilization (1 hpf) and continued until the end of embryogenesis (72 hpf). Another timepoint focusing on the larval stage began atrazine exposure at 72 hpf and ended at 120 hpf. After exposure was ceased, RNA was isolated, cDNA was synthesized, and qPCR assessed one hypothalamic target (gnrh) and three pituitary targets (gh1,fshb, lhb). Using an analysis of variance (ANOVA, α=0.05), six biological replicates were statistically compared. At both timepoints gh1 displayed significant alterations in relative gene expression. There were no statistically significant changes in relative gene expression in both the 1-72 hpf and 72-120 hpf groups for gnrh, fshb, and lhb.

Mentor(s):

Jennifer Freeman (HHS); Sydney Stradtman (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 622

Presentation Time: Session 3: 2pm-3:30pm

Parental Satisfaction and Drinking Behaviors: Their Influence on Adolescent Alcohol Expectancies

Author(s):

Jillian Szweda† (HHS, Honors)

Abstract:

Parents who report problematic drinking were found to have children with higher positive alcohol expectancies (Smit et al., 2020). Parents of adolescents who do not abuse alcohol view their own parenting as a greater positive personal asset/characteristic than parents of adolescents who abuse alcohol (Fairlie et al., 2013). Parents who reduced their problematic drinking report more satisfaction with their parenting (Watkins et al., 2009). I hypothesize that parent alcohol use is associated with adolescent positive alcohol expectancies and that parental satisfaction and stress mediates the association.

Data are from 1,021 adolescents, aged 10-to-15 years (M=12.22, SD=0.98), and a parent. Adolescents self-reported their positive alcohol expectancies on a 4-point Likert scale (M = 2.38, SD = 0.75). Parents alcohol use was measured as the sum of dichotomously coded drinking activities with frequency of drinking in front of children (0=no drinking to 8=all drinking activities endorsed and always done in front of children). Parents' satisfaction and stress was averaged higher scores reflecting more satisfaction and less stress (M = 3.98, SD = 0.55). Adolescent age, sex, and household income were included as covariates. Mediation regression model, conducted in SAS, revealed no total effect (b=-0.01, p=0.99) nor indirect effect (b=0.01, p=0.13). There was no direct effect of parent alcohol use on adolescent positive alcohol expectancies (b=-0.01, p=0.86) nor parent satisfaction and stress on positive alcohol expectancies (b=-0.08, p=0.07). Parent alcohol use was related to parent satisfaction and stress (b=-0.03, p<0.05): as alcohol use increases parent satisfaction deceases and stress increases.

Mentor(s):

Kristine Marceau (HHS); Amy Loviska (HHS); Kristina Jackson (Brown University); Michelle Rogers (Brown University)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 623
Presentation Time: Session 3: 2pm-3:30pm

Using different neural networks to optimize automated classification of audio recordings from passive acoustic monitoring network to detect endangered species in a US Air Force base

Author(s):

Anthony Tan† (Science)

Abstract:

The sudden drop in biodiversity globally commonly referred to as the sixth mass extinction requires innovative methods for monitoring. Passive acoustic monitoring (PAM) is a new method that enables researchers to solve complex ecological problems such as estimating wildlife density and species richness. Acoustic data from PAM results in massive amounts of unstructured data that needs to be labeled by manually identifying visual and acoustic features. Several computational models in machine learning approaches (deep learning, artificial intelligence) have emerged to help automate labeling but often lack the data required for trained analysis. As there are limited acoustic training datasets, scientists are searching for new solutions. One solution to this problem is the use of transfer learning, or adaption of existing pretrained models with lower amounts of training data called Siamese Neural Networks (SNNs). SNNs are yet to be used with wildlife detection problems. In this project, we aim to identify endangered bird species calls and songs at a US Air Force base being monitored by the US Fish and Wildlife Service (USFWS) in varying habitats in Florida using an SNN with Mel-based spectrograms (a visualization for using a fast-fourier transform of acoustic data). Using six sentinel locations, we predict that the SNN will improve accuracy from other models to a level higher than 95%.

Mentor(s):

Kristen Bellisario (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 624
Presentation Time: Session 3: 2pm-3:30pm

Designing an Efficient Test PCB for SoCET's AFTx05 SoC

Author(s):

Vijay Tummalapenta† (Engineering)

Abstract:

Every SoC (system-on-chip) that is manufactured can benefit from testing. While there are verification processes in place to check if the chip will function, designing a PCB (printed circuit board) to physically test the SoC can add another layer of safety before implementing the chip into a project. Purdue's System-on-Chip Extension Technologies team recently taped-out a chip labeled "AFTx05." This project aims to build a board to test the capabilities of the x05. The schematic capture and PCB design software KiCAD will be used to create the board. The board will be designed to work with the x05's unique 1.8V logic voltage and package while having header outputs for the chip's pins. Proper design techniques, such as decoupling capacitors and voltage regulators, will be used when designing the board. The board will be expected to properly test and protect the AFTx05 SoC. This board can also allow the chip to be used in trivial project applications. In conclusion, test PCBs are essential when manufacturing a chip and can be very helpful in interfacing with the chip itself.

Mentor(s):

Mark Johnson (Engineering); Rauf Erkiletlioglu (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 625
Presentation Time: Session 3: 2pm-3:30pm

When is a peep a fear peep? Characterization of chicken vocalizations during an isolation fear test.

Author(s):

MacKenzie Ulrey† (Science); Anne Taylor‡ (Agriculture)

Abstract:

The isolation fear test is widely used to determine welfare states in poultry. The belief is that if a chicken with poor welfare is placed in a novel environment, the bird will vocalize for a longer period of time compared to a chicken from a good welfare environment. However, we have observed that broilers make multiple types of vocalizations during these tests. Thus, we set out to characterize the types of vocalizations made by broilers when placed in a novel environment. Broiler chicks (n = 12) at 7, 14 and 21 days old were placed in an anechoic chamber as the novel environment. The birds' vocalizations were isolated and labeled using a predetermined naming system, and analyzed through Adobe Audition and Praat, phonetics software packages. Spectrograms were used to analyze the frequency, amplitude, shape, and number of pulses of each vocalization. We analyzed 24 different vocalizations among the 12 birds. We found 3 birds only made one type of vocalization throughout the two minutes. 5 birds were delayed by (20 seconds) before they made any vocalizations. 4 birds tended to make vocalizations that were similar in 'structure'/sound while most birds had no discernable pattern to their vocalizations. The maximum number of vocalizations from a single bird were 144 while the fewest vocalizations were just 3. The next step of this study will be to determine how each specific vocalization is related to the birds' their behavioral and physiological responses to determine if the vocalizations are actually related to fear.

Mentor(s):

Greg Fraley (Agriculture); Jeff Lucas (Science); Jenna Schober (Agriculture); Melanie Bergman (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 626
Presentation Time: Session 3: 2pm-3:30pm

Nonword Repetition Performance in Preschoolers With and Without Speech Sound Disorders

Author(s):

Giulia Virga† (HHS); Emily Wood† (HHS); Sophie Minakata† (HHS)

Abstract:

Children with speech sound disorders (SSD) produce more speech errors than expected for their age and are less intelligible than their peers with typical speech and language development (TD). These children represent the highest proportion of cases seen by pediatric speech-language pathologists. Nonword repetition tasks are often used, together with formal speech and language assessment, to identify children with SSD. Despite their ease of administration, the need for articulation accuracy is problematic for scoring the performance of children with SSD on some nonword repetition tasks. To address this difficulty, the Syllable Repetition Task was developed for speakers with SSD. In this study, we compared the accuracy and types of speech errors produced by children ages 4 and 5 years with SSD or with TD. Although overall accuracy of nonword repetition differentiated between children with SSD and children with TD, it lacked the specificity to differentiate among children with SSD and typical language skills and children with SSD with concomitant language disorder. We are now investigating whether nonword repetition error characteristics differentiate between children with SSD and typical language skills, and children with SSD and concomitant language disorder. Preliminary results indicate that children with SSD and language disorder produce more vowel errors and more migration errors than the other two groups of participants.

Mentor(s):

Françoise Brosseau-Lapré (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 627
Presentation Time: Session 3: 2pm-3:30pm

Membrane binding determinants of for Cationic Amphiphilic Polyproline Helices (CAPHs)

Author(s):

Andrew Walke† (Science)

Abstract:

Cationic Amphiphilic Polyproline Helices (CAPHs) are cell-penetrating peptides and can transport small molecule, nonpermeable therapeutic cargoes through cellular membranes and into cells. CAPHs have low cytotoxicity but little is known about their mechanisms of membrane interactions and uptake. We are working to determine the kinetic determinants for CAPH-membrane interactions to inform their design and efficiency. Using an in vitro reconstitution based method on stacked supported lipid bilayers, I am investigating the spatiotemporal interactions between CAPHs and model membranes. Imaging in a Total Internal Reflection Fluorescence (TIRF) Microscopy configuration allows measurements to be taken at the single molecule level to measure the distribution of kinetic and mobility behaviors. Using this method, I have found that the inclusion of cholesterol in the membrane increases the rate of recruitment to the bilayer. This finding will be expanded to live cell membranes and to bilayers of increasing complexity. We anticipate our findings will create actionable insights to tune CAPH activities.

Mentor(s):

Shalini Low-Nam (Science); Jean Chmielewski (Science); Kevin Scrudders (Science); Vinny Menon (Science); Thomas Dietsche (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 628
Presentation Time: Session 3: 2pm-3:30pm

Analyzing Osseous Tissue of Ducks by Reference Point Indentation via the BioDent

Author(s):

Hannah Walls† (Agriculture, Honors)

Abstract:

Interest in understanding meat-type poultry skeletal integrity has increased due to selective breeding for rapid maturation and increase of skeletal muscle volume. The amount of muscle that poultry develops in a short time puts stress on the bird's body, including bones and joints, leading to skeletal issues. With Indiana being the top duck producing state, there is vested interest in ensuring proper skeletal integrity under rapid growth conditions. Current skeletal quality analysis methods (computed tomography [CT], radiography, breaking strength, bone mineral content [BMC]) are lacking in their ability to analyze bone in vivo, on-farm. A new method, reference point indentation (RPI), uses microindentation to assess bone and has the ability to be used in vivo on-farm, but must first be validated ex vivo. This study aimed to evaluate the use of RPI to analyze osseous tissue ex vivo in Pekin ducks by comparison to traditional methods. The left tibiae, humeri, and femurs of 25 ducks were CT scanned for digital bone mineral density (dBMD) and tested with RPI. Data collected from RPI include indentation distance increase (IDI; indicator of bone resistance). Tibiae and humeri were subjected to 3-point bending for breaking strength and ashed to determine BMC. Data were analyzed using the COR function in R. With all bones combined, IDI was moderately correlated with dBMD ($r=-0.44$, $p<0.001$), not correlated with fracture force ($r=-0.11$) or BMC ($r=-0.17$). There is promise in using RPI to assess poultry bone, but further investigation of the relationship with fracture force and BMC is required.

Mentor(s):

Darrin Karcher (Agriculture); Brittney Emmert (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 629
Presentation Time: Session 3: 2pm-3:30pm

Comparing the tRNA in PurduePete with Other Bacteriophages in C1 Cluster

Author(s):

Beining Wang† (Engineering); Cooper Sims† (Agriculture); Zaccary Anderson† (Pharmacy); Adyan Khan† (Engineering); Molly Geiger† (Engineering); Kayla Scott† (Engineering); Miriam Walker† (Agriculture); Emma Newton† (Engineering)

Abstract:

PurduePete is a mycobacteriophage: a virus which utilizes the species mycobacteria as its host.

The purpose of the study is to determine how tRNA genes in the base pair region 126919 - 126999 of the mycobacteriophage PurduePete, discovered in 2022, compares to tRNA of other mycobacteriophages in the C1 cluster. In bacteriophage, the purpose of tRNA is to aid translation, specifically in larger bacteriophages, such as those in the C1 cluster. Bacteriophages rely on their host cell to duplicate, including host cell tRNA, but begin degrading host RNA and DNA upon infection. Despite increasing the genome size, tRNA in bacteriophage genomes may allow them to duplicate more quickly, increasing their competitiveness. The methods used to compare tRNA genes in the C1 cluster involve analysis through DNA Master, GeneMark, and Phamerator. In annotating tRNA in the genome of PurduePete specifically, Aragorn and tRNAscan-SE programs were utilized, favoring Aragorn predictions over tRNAscan-SE. These programs provide insight into start codons, anticodons, and overall probability of existence in the genome. Other C1 bacteriophages contain tRNA coding for Glutamine beginning at base pair 126919, and Asparagine beginning at base pair 126999, suggesting PurduePete will contain similar genes. While not all bacteriophages contain tRNA, many within the C1 cluster do. Analysis of tRNA in PurduePete will lead to further investigation into the purpose of tRNA within other C1 bacteriophages.

Mentor(s):

Kari Clase (Agriculture); Aaron Gin (Engineering); Jason Lee (Engineering); Quintin Walter (Engineering); Rhutuja Patil (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 630
Presentation Time: Session 3: 2pm-3:30pm

A Comparison of Standardized qPCR Protocols for OPs in Drinking Water

Author(s):

Ruth Wei† (Science); Gavin Duffy* (Agriculture, Engineering)

Abstract:

Abstract Redacted.

Mentor(s):

Caitlin Proctor (Engineering); Aliya Ehde (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 631
Presentation Time: Session 3: 2pm-3:30pm

Guided de novo design of a triple helix SARS-CoV-2 inhibitory protein

Author(s):

Xander Weintraut† (Science, Honors)

Abstract:

The creation of new proteins is a recent field of exploration, which has become especially important in the development of treatments which could prevent infection from SARS-CoV-2. SARS-CoV-2 relies on the binding of the receptor binding domain (RBD) of its spike proteins to the ACE-2 receptor protein on the surface of human cells. Inhibition of the RBD would effectively prevent infection. Automated generation of inhibitor proteins is so far good at predicting how a protein will fold, but so far is not very good at purpose-generation of new proteins. Human-led design combined with automated techniques can lead to more effective design of proteins. In addition, relatively small, compact proteins are preferable in design, as they can be administered directly through the respiratory system, while larger ones cannot. While prior research has been able to uncover useful inhibitors for SARS CoV-2, they relied on randomly generated designs, not human-led creation. Due to these past limitations, this research seeks to find a low-energy, compact inhibitor of SARS CoV-2 using human-guided de novo protein design. Binding affinity is evaluated using three computational metrics: Delta-Delta-G (DDG), which measures the stability of the proteins in the bound state when compared to unbound, Interface Surface Area (SASA), which measures the size of the binding interface, and Shape Complementarity (SC), which measures how well the protein fits into the RBD. Studies have indicated that the most stable compact inhibitors tend to be 3-helical structures, so that is where this design is focused.

Mentor(s):

Zahra Tehrani (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 632

Presentation Time: Session 3: 2pm-3:30pm

Patellar tendon morphology in young and older adult women.

Author(s):

Hannah Winstone† (HHS)

Abstract:

Loss of estrogen with menopause is a risk factor for tendon injuries, a significant clinical problem impacting the ~25 million women in the US who reach this stage in their life course each year. Overall, the changes in tendons during menopause likely contribute to significant physical impairment and reduced quality of life. However, few well-controlled and powered studies have carefully detailed the changes in tendon properties in young and older adult women. We hypothesized that morphological properties would be altered in older adult women compared to young. Twelve premenopausal women (Age: 25±1 yrs, BMI: 23±1) not using oral contraceptives and 25 postmenopausal women (Age: 64±1 yrs, BMI 27±1) not currently using hormone therapy, voluntarily participated in this investigation. This project was approved by the Purdue University IRB (#18120STEW 21481). Patellar tendon cross-sectional area (CSA) and signal (indication of tendon fibril organization) were examined using magnetic resonance imaging (MRI). All data were analyzed with a Mann-Whitney test. Average patellar tendon CSA was greater in older women (113±3 mm2) compared to young (99±6 mm2). Regional differences in patellar tendon CSA have been reported, and we found that the differences in tendon CSA were limited to the mid and distal regions. In contrast to CSA, we did not observe any difference in mean (young: 478±23; old: 488±49) or regional patellar tendon signal (p<0.05). In conclusion, our results suggest that aging results in regional changes in patellar tendon CSA in women, but MRI indicators of fibril organization are unchanged.

Mentor(s):

Chad Carroll (HHS); Nathan Campbell (HHS); Anna Barker (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 633
Presentation Time: Session 3: 2pm-3:30pm

A Failure Analysis of Deep Learning Interoperability Software

Author(s):

Joseph Woo† (Science)

Abstract:

Introduction/Background:

ONNX was developed to act as a standard format that can be used to transfer models between deep learning frameworks or to runtimes. However, the quality of interoperability offered by software like this is still unknown.

Poor interoperability software has been recorded to bring about a variety of issues. One such issue is security holes, as Keras models converted to CoreML are two times more susceptible to FGSM adversarial attacks. To avoid situations where this can lead to critical malfunction, an analysis of the quality of interoperability software is needed. We performed a failure analysis on the open-format converter ONNX.

Methods:

1. Studying and classifying 250+ Github issues under the Tf2-ONNX and PyTorch repository, focusing on bug reports relating to ONNX. 2. Analyzing real-world DL models from the Hugging Face Repository and testing the ONNX conversion process with 1,761 different applied models across 58 different architectures with both the PyTorch and Tensorflow framework. 3. Utilizing the NNSmith fuzzing tool to randomly generate thousands of models with varying dimensions, nodes, and architectures in order to limit test the converter against all possible models within reasonable specified parameters.

Results: Although the study is still ongoing, we find that among 1761 models converted from both PyTorch and Tensorflow, 53 (3%) Tensorflow models failed to convert and 243 (13%) PyTorch models fail to convert.

Conclusion: We recommend standardized automated testing of model converters, and a reduced operator set within ONNX for converting critical models performing sensitive tasks requiring high translation quality.

Mentor(s):

James Davis (Engineering); Purvish Jajal (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 634
Presentation Time: Session 3: 2pm-3:30pm

Characterization of an Amino Acid Substitution in the VP4 Structural Protein of Enterovirus D68

Author(s):

Kayla Wrobleski† (Science, Honors)

Abstract:

Enterovirus D68 (EV-D68) is a single stranded positive-sense RNA virus first isolated in 1962. EV-D68 is a respiratory virus in the Picornaviridae family implicated in recent biennial outbreaks of Acute Flaccid Myelitis (AFM) in young children. AFM causes a flaccid paralysis like polio and can lead to permanent muscle weakness. Currently, there is no specific treatment for AFM. EV-D68 is a pseudo-T=3 icosahedral virus with 60 copies each of four structural proteins. VP1, VP2, and VP3 make up the virus capsid, while VP4 resides on the internal capsid surface. The structural proteins of EV-D68 are determinants of capsid meta-stability, viral breathing, and viral entry and serve as immunogens for the human antibody response. Most work focuses on VP1, however, VP4 is the most conserved structural protein among enteroviruses. Despite this, not much is known about how VP4 influences EV-D68 infection. We hypothesize that a highly conserved enterovirus VP4 residue, lysine 42 (K42), influences the capability of EV-D68 to cause infection. From the results of ongoing K42 mutagenesis experiments, we suggest that VP4 K42 plays a role in EV-D68 entry. We believe K42H reduces the ability of EV-D68 to enter cells by altering VP4 dynamics that overall weakens capsid stability. Additionally, results indicate that the K42H mutation decreases the rate of virus growth. Further characterization of the K42 residue will continue to illustrate how VP4 is important for viral entry which can lead to more targeted treatments for EV-D68.

Mentor(s):

Richard Kuhn (Science); Jacqueline Anderson (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 635
Presentation Time: Session 3: 2pm-3:30pm

Purification of the STN8 kinase to investigate the role of phosphorylation in Photosystem II disassembly.

Author(s):

Addison Young† (Science)

Abstract:

Photosystem II (PSII) is the photosynthetic pigment-protein complex responsible for harvesting electrons from water and directing them to the plastoquinone pool, which eventually reduces NADP+. Issues arise when water oxidation fails, generating reactive oxygen species (ROS). These ROS cause damage to the protein subunits of PSII, especially the D1 protein which ligates several important red/ox-active cofactors. When the D1 protein is significantly damaged, PSII is photo-inhibited. It is thought that phosphorylation aids in the rapid turnover of the D1 subunit; however, the precise mechanism is unknown. PSII is mainly phosphorylated through two kinases, STN7 and STN8. STN8 is responsible for core protein phosphorylation in PSII, which is believed to aid the separation of PSII disassembly for core protein replacement. This mechanism, however, is poorly understood. The goal of our research is to purify functional STN8 and perform a kinase assay to gauge the STN8 kinase activity. We purified Arabidopsis thaliana STN8 through Maltose Binding Protein (MBP) affinity chromatography. MBP tagged STN8 was expressed in transformed E. coli using pMAL-c5x expression vector encoded with the full length STN8 kinase. We expect the purified STN8 kinase to phosphorylate PSII proteins and induce disassembly of PSII in-vitro.

Mentor(s):

Sujith Puthiyaveetil (Agriculture); Steven McKenzie (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 636
Presentation Time: Session 3: 2pm-3:30pm

A Nutritional Analysis of Purdue Dining Courts

Author(s):

Peter Zakariya† (Science); Samskrithi Sivakumar† (Science); Michael Cheng† (Science); Anika Mathur† (Science); Tanishka Kulkarni‡ (Science)

Abstract:

There is an increasing amount of college students that require dietary restrictions within their meals that are often overlooked. This study aims to explore the feasibility of adhering to certain diets as a university student by examining the nutritional information of meal options at Purdue University's dining courts. Four popular diets, keto, paleo, 40/30/30, and vegan/vegetarian, were considered. The study analyzes data collected from the Purdue Dining API and the Purdue Dining website, which contain items served in the past, the dining court in which they were served, and their nutritional information. After calculating the percentages of carbohydrates, fat, and protein within food items, we evaluated the ability of each dining court to offer a minimum combination of three items (classified as a meal) that meet the macronutrient restrictions of each diet. With our current discoveries, we found that it is difficult to find a large range of items that fit the nutritional needs that we have outlined. Although there are days that contain zero meals that fit the dietary constraints, generally there are at least one meal that is applicable. From our research, we seek to evaluate the propensity of each of Purdue's dining courts in providing accessible food options for students with dietary restrictions in order to allow students access to healthy meals. The findings of this study can be used to identify potential areas in which food options can be expanded to better support the dietary needs of Purdue's student population.

Mentor(s):

Timothy Keaton (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 637

Presentation Time: Session 3: 2pm-3:30pm

"Urbanization, Migration, and Indigenous Health in Peru"

Author(s):

Gracie Turner† (HHS)

Abstract:

Urbanization, Migration and Indigenous Health in Perú

1A Veile, 2R Chavez Cabello, 1E Otárola-Castillo, 3V Rojas-Bravo, 1G Turner

1Department of Anthropology, Purdue University, West Lafayette IN, 2Facultad de Ciencias Sociales, Universidad Nacional Hermilio Valdizán, Huánuco, Perú, 3Facultad de Enfermería, Universidad Nacional Hermilio Valdizán, Huánuco, Perú.

Objective: We compare demographic and anthropometric characteristics and blood pressure in rural and urban Peruvian indigenous women, as preliminary results from a project on urbanization, migration and indigenous health. Methods: Demographic, socioeconomic, and anthropometric characteristics and blood pressure data are compared for 185 Peruvian women in a rural (n=92) and an urban (n=93) community. The rural community is located in a hilly region in the Department of Huánuco (altitude ~2100 m, population ~450). The urban population is from a “pueblo joven” or shanty town in southern Lima (altitude ~333 m, population ~40,000). Data were collected cross-sectionally (2019) and are compared here using t-tests, Mann-Whitney U, and chi-square tests. Results: Sampled women were median=38 years old (IQR=18, range=18-34) with median=3 children (IQR=2, range=0-10), with no significant rural-urban demographic differences. Rural women had lower Spanish literacy (48.9% versus 94.6%, p=<0.01) and engaged less in wage labor (3.3% versus 34.4%, p=<0.01) compared to urban women. There were no significant rural-urban differences in height (cm) (μ=148.5±4.8, range=138-159 versus μ=149.2±5.2, range=137-162, t=-1.2, p=0.22), waist circumference (cm) (μ=90.4±12.4, range=65.5-126 versus μ=90.4 ±11.1, range=64-125, t=0.1, p=0.9), or median BMI (28, IQR=6.5, range=16.7-38.4 versus 28.2, IQR=6.0, range=18.8-47.1, u=0.09, p=0.77). However, elevated and high blood pressure were more prevalent in urban women (11.4% versus 23.9%, and 22.7% versus 33.7%, respectively). Conclusions: Despite major lifestyle differences, there were no anthropometric differences between the rural and urban indigenous Peruvian women. This may reflect dietary similarities, or the fact that many urban women are migrants from rural communities. The higher prevalence of elevated and high blood pressure in the urban community may reflect social stressors, rather than dietary differences.

Mentor(s):

Amanda Veile (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster Presentation Abstract Number: 638

Presentation Time: Session 3: 2pm-3:30pm

Updated KXRF Spectral Analysis Algorithm using MATLAB

Author(s):

Anders Johnson† (Engineering)

Abstract:

X-Ray fluorescence (XRF) is an analysis technique used to determine the elemental composition of a sample. In our lab, advanced XRF systems are used to quantify elemental concentrations in human tissues in vivo, such as a cadmium-109 induced K-shell XRF (KXRF) bone lead (Pb) measurement system. As Pb accumulates in bone over time, bone Pb is the best bio marker to assess long term Pb exposure and to study the related health effects especially chronic effects such as neurological impairment. In order to extract concentration values from the XRF machine's spectral output, in house analysis software was developed to fit the x-ray energy peaks in the spectrum and to obtain the net Pb x-ray counts for the peaks. This analysis process is inefficient, written in the coding language FORTRAN, and was designed for 32-bit computers. To accomplish this, new code has been written in MATLAB to perform the same curve fitting algorithms and calibration procedure. The peak fitting involves Gaussian curves for the net peak and exponential curves for the background. Net counts from in vivo measurement are compared with an established calibration line to determine bone Pb concentration. The results given by the new software currently have a larger error in the curve fit portion than the FORTRAN code, so the software is not ready to be implemented. Though the new code is not currently viable, further optimization and fine tuning could improve the error and allow the software to be adopted as the primary analysis method.

Mentor(s):

Linda Nie (HHS); Alexis Webb (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

RESEARCH TALKS

APRIL 13, 2023

STEWART CENTER 214

Research Talk Presentation Abstract Number: 700
Presentation Time: STEW 214A at 9:00am-9:20am

Managing Nurse Cognitive Load in Emergency Patient Care Situations with the use of Decision-Making Aids

Author(s):

Clare Goodman† (Engineering)

Abstract:

When nurses care for a patient, they are required to make a variety of decisions such as when to escalate care (e.g., consulting physicians or other providers) and what information is salient to the patient's status. Understanding nurse cognitive load and its impact on decision making is paramount to training. Cognitive load (CL) is the level of demand imposed on working memory as an individual processes information. In urgent situations, nurses are exposed to large amounts of information in a limited time. In novel situations, of the impact of CL is substantial. Furthermore, under CL and in urgent situations, automatic processing is activated, which can impact decision making.

In this study 27 novice nurses participated in a simulation where the patient manikin experiences a stroke. Nurses wore a heart rate monitor, eye tracker, as well as a Microsoft HoloLens, which is an augmented reality headset. The HoloLens was only used in the experimental condition. The HoloLens displayed a checklist to assist decision making. We hypothesize that the HoloLens will reduce CL and stress. The readings from these instruments and the NASA-TLX survey captured the time to decision, CL, and perceived CL respectively. Heart rate variability (HRV) is correlated to stress and cognitive workload. In situations where CL is high, HRV will decrease. The HRV readings and fixation periods will be used to determine the nurse's stress and CL. The results of this study can enhance nurse training and inform decision making models based on identified stimuli that heighten CL.

Mentor(s):

Denny Yu (Engineering); Nick Anton (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 701
Presentation Time: STEW 214A at 9:20am-9:40am

VF PLUME: Vertical Farm Plant Localizing UAV with Mass Estimation

Author(s):

Alexander Hanna† (Engineering); Weicheng Lee† (Engineering); Craig Cheung† (Engineering)

Abstract:

As urban populations become larger and denser, there is more of a need for compact farming. Vertical farms have become increasingly important due to their higher crop yields in smaller spaces and year-round production - derived from their ability to control environmental factors which can help plant growth.

However to control the environment, there must be a way of determining the current states of the plants and environment. Hardwired, permanent sensors and cameras monitoring growth and environmental conditions can be very expensive and hard to maintain in expansive farms. In response, an unmanned aerial vehicle (UAS) was developed to traverse a farm and provide plant growth and environmental condition feedback. Being a singular, contained vehicle, there is no longer a need for large, complicated monitoring systems.

The solution first determines its location through a localization algorithm that utilizes known permanent apriltags and camera matrices. With this location, environmental sensor data can be read and processed to create 3D maps of information including temperature, humidity, air quality (IAQ), and the presence of dozens of chemicals. Plant health can then be found by estimating mass with a matrix representation of the plant which is found utilizing a 3D point cloud and a segmentation algorithm to be able to differentiate each plant from other plants and its surroundings.

The ability to capture and process this plant and environmental data using a single, contained system allows more effective farming to support continued population growth and densification.

Mentor(s):

James Goppert (Engineering); Krishna Nemali (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 702
Presentation Time: STEW 214A at 9:40am-10:00am

Visualizing Stress Fields in Composites Using Mechanophores

Author(s):

Tristan Wiley† (Engineering)

Abstract:

A mechanophore is a molecule that undergoes a chemical change due to mechanical stimulation. The mechanophore used for this project is spiropyran, which experiences an increase in fluorescent intensity with mechanical stresses that is both qualitatively and quantitatively measurable. Composite materials are novel and have many uses, but their failure modes and stress concentrations can be complex. Spiropyran was used to ‘see’ stress fields of composites comprised of poly(dimethyl siloxane) with a glass bead inclusion that underwent a tensile test. Matrix-bead adhesion was modified to observe the effect of stress transfer on stress fields and mechanical behavior. With increasing adhesion, effectiveness of stress transfer from soft matrix to stiff inclusion increased, leading to higher elongation at failure. New failure modes were also observed at high adhesions, showing how an ideal stress transfer state fails at break. These tests, due to imaging methods, take a long time to complete. PDMS is a viscoelastic polymer, meaning stress relaxation is a factor that must be taken into account for intensity purposes to properly correlate intensity to stress. Stress relaxation tests show that PDMS with xylenes and spiropyran have altered stress relaxation mechanical properties, but stress relaxation does not impact the intensity of the spiropyran. Mechanophores are an important tool to understanding the mechanical behavior of composites and other complex structures, but only if their behavior is understood first.

Mentor(s):

Chelsea Davis (Engineering); Jared Gohl (Engineering); Nazmul Haque (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 703
Presentation Time: STEW 214B at 9:00am-9:20am

Detecting Age-Related Changes in Gait Using Inertial Measurement Units

Author(s):

Elsa Davis† (HHS, Honors); Mithran Periassamy† (HHS, Honors); Guilherme Basso* (Engineering, Honors); Hala Haddad* (HHS); Amanda Martin* (HHS); Braden Stock* (Engineering); Morgan Rinkema* (HHS)

Abstract:

Validated and reliable assessments of mobility are routinely used in clinics to track patient progress following rehabilitation, assess the need for assistive devices, and predict risk of falling. These tests typically require patients to perform tasks that require varying degree of difficulty so that therapists can observe changes in mobility and balance that can occur as a function of age and neurological disease. Evidence suggests that subtle changes in gait may begin as early as middle-age and can potentially predict the future onset of mobility difficulties. However, standard clinical tests which rely on visual observation are designed to capture easily observable balance and gait problems in patients, rather than small changes that begin in middle-age. In this study we examine mobility changes that occur as a function of age using a common clinical test, the functional gait assessment, while participants wear small sensors, called inertial measurement units (IMUs), that can capture subtle differences in gait patterns between young and middle-aged adults. IMUs were placed on each ankle and the trunk. Participants completed a health history questionnaire and performed the FGA test twice. Preliminary data suggests that changes in gait variability begin to increase in middle aged adults (especially towards the end of the gait cycle). Subtle changes in gait velocity and the velocity of the leg as it swings also appears to emerge. Using IMUs to capture changes in gait patterns of middle-aged participants may help to early identify those who are at future risk of having mobility difficulties.

Mentor(s):

Jeffrey Haddad (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 704
Presentation Time: STEW 214B at 9:20am-9:40am

Chlorpyrifos and chlorpyrifos-oxon exposures lead to the dysregulation of basal glutamate release in human-induced pluripotent stem cell-derived glutamatergic neuron

Author(s):

Adam Barmash Rubinchik† (HHS)

Abstract:

Chlorpyrifos (CP) is an organophosphate pesticide/insecticide developed for agricultural and household settings. Chlorpyrifos, or its more toxic metabolite CP-oxon (CPO), causes a wide range of health complications such as neurological dysfunction, immunotoxicity, and developmental disruptions. This study aims to determine the neurotoxic effects of CP/CPO on glutamate (GLU) release, characterize baseline GLU dynamics in human GLUergic cortical neurons, and address a gap in neurotransmitter monitoring using novel biosensors. GLUergic cortical cultures were differentiated via dual-SMAD inhibition from human induced pluripotent stem cells (hiPSCs). Upon maturation (>D90), a baseline collection (in HBSS) for extracellular GLU was performed followed by a 24-h exposure to CP (3 μM – 300 μM) or CPO (0.1 μM – 10 μM). Following exposure, cells recovered for 24h with an additional GLU collection. Subsequently, whole-cell protein lysates were harvested to correct measured GLU release for cell density. An additional set of collections with vehicle exposure was performed at 10-min intervals over 60 min to monitor GLU efflux kinetics. The collections were analyzed with a commercial GLU kit. Cells exposed to CP demonstrated a concentration-dependent increase in net GLU release, while cells exposed to CPO presented no significant effect. The upregulation persisted over 24 h. GLU release was identified to sharply increase over 0-15 min and plateau after 20 min. Newly developed enzymatic electrochemical biosensor arrays with cell culture compatibility were utilized to replicate these findings. Overall, this study reveals a potential new mechanism for neurotoxicity, establishes a better understanding of GLU dynamics in vitro, and introduces innovative sensor technology.

Mentor(s):

Aaron Bowman (HHS); Anke Tukker (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 705
Presentation Time: STEW 214B at 9:40am-10:00am

Explaining the Interaction of Perceived Health, Chronic Conditions, and Mortality: Role of Allostatic Load

Author(s):

Lauren Voss† (HHS)

Abstract:

As we age, the body experiences “wear and tear” that can lead to physiological dysregulation or allostatic load (AL). AL, in turn, affects objective (e.g., chronic disease) and subjective (e.g., self-rated health (SRH)) aspects of health, including mortality. Recently, we found that SRH moderated the association of chronic disease burden and mortality: mortality risk did not increase with higher disease burden when SRH was excellent. This study hypothesized that AL could, at least partially, explain the SRH interaction with chronic conditions as a predictor of mortality. Data were from the second data wave and the biomarker project of the Midlife in the US study (MIDUS, N=1,255). Mortality data were collected through 2018. The AL scale was calculated by examining participants’ biomarkers in seven biological subsystems. If at least half of the biomarkers per subsystem were classified as high-risk, and at least six of seven subsystems were high-risk, the subject was labeled as being high-risk. Results from logistic regression models demonstrated mortality risk increased when an individual was high-risk (p<.05). Interestingly, mortality risk also increased when SRH conflicted with disease burden (SRH=poor, but MWI=0). In contrast, results for low-risk participants remained consistent with previous findings that SRH attenuates the association between disease burden and mortality. These results suggest when an individual is low-risk, the best outcomes occur when optimistic about one’s health; however, high-risk individuals experience optimal outcomes when feelings about their health are realistic, while optimism, or pessimism, are associated with higher rates of mortality.

Mentor(s):

Elliot Friedman (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 706
Presentation Time: STEW 214C at 9:00am-9:20am

CFD Modeling of Liquid Injection in a Rotating Detonation Combustor

Author(s):

Alexander Suppiah† (Engineering)

Abstract:

This study provides an initial computational assessment of the Eulerian Dispersed Phase (EDP) multiphase model from Metacomp Technologies for a modeled ethanol jet in a high speed cross flow. Good agreement is achieved between CFD jet trajectories and high-speed PLIF imaging in cold flow. A supersonic jet-in-crossflow correlation developed in a supersonic wind tunnel is also considered and shows similarity.

Mentor(s):

James Braun (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 707

Presentation Time: STEW 214C at 9:20am-9:40am

Drivers of the Local Distribution of Avian Cholera in California

Author(s):

Dylan Clarke† (Science)

Abstract:

Avian Cholera (AC) is a disease of birds caused by P. multocida with a mortality rate near 100%. The disease is rare in the United States, with only 253 outbreaks and ~391,000 cases from January 2002 to May 2022 with 128 of these cases located in California, the epicenter of the disease in the United States. The high mortality rate however results in the disease often wiping out entire flocks. This can be a major problem economically as the disease can spread quickly and severely, decimating the population of endangered species. In this study, bird populations and climate conditions were tested using mixed effects logistic regression models with disease data from the WHISPers statistical database of the United States Geological Survey for wild birds. First, a spatio-temporal description of the data was conducted before univariate logistic regression models were made. Finally, a full model was built on the California subset of the data using the mixed effects logistic regression model and an additional CART model was developed to support the findings. We identified statistically significant (multivariable p-value <0.05) associations between outbreaks of the disease and waterfowl, time of the year, and temperature. The results indicate that the model explains the spatial and temporal distribution of the disease as well. The results are consistent with the hypothesis that lower temperatures and high populations of waterfowl play a role in the transmission of the disease and can potentially be used to direct focus of diagnostics and prevention.

Mentor(s):

Wendy Beauvais (Veterinary Medicine); Eric Kontowicz (Veterinary Medicine)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 708
Presentation Time: STEW 214C at 9:40am-10:00am

Automated Crater Morphology Characterization on the Moon Using an Unsupervised Neural Network

Author(s):

Sara Cuevas-Quiñones† (Science, Honors)

Abstract:

Impact craters are one of the most predominant geological features on the Moon. Craters provide windows into a planet's geology, and their morphologies provide important information into the properties of the body that was impacted and the processes that have occurred since the crater formed. While previous lunar crater classification has been done by hand, it can be time consuming given the sheer number of craters that are on the Moon. We propose the use of unsupervised machine learning techniques for a more systematic approach to crater characterization. Unsupervised machine learning techniques deal with finding patterns in unlabeled data. One of their main purposes is to achieve a form of dimensionality reduction, that is, condensing data into fewer features while still retaining its most important aspects. Using the python deep learning packages Keras and Tensorflow, we construct an autoencoder to categorize the morphology of simple craters and explore the natural clustering that results when crater images are put through the autoencoder. We find the autoencoder technique to be promising for future crater characterization for it is able to distinguish pristine vs. degraded vs. breached walls at maria margins. Furthermore, it can characterize coldspot vs. non-coldspot craters.

Mentor(s):

Ali Bramson (Science); Lior Rubanenko (Stanford University)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 709
Presentation Time: STEW 214D at 9:40am-10:00am

The Plant Data Service: Developing An Ontologically-Consistent Approach to Sharing Functional Data

Author(s):

Autumn Denny† (Engineering)

Abstract:

The realm of agriculture has faced a growing need for open-source software, which is essential to any domain of practice that values transparency, interoperability, and extensibility. Despite the identified necessity, there is a lack of commonly-used and reliable data and architectural standards for software created within the context of agriculture and food.

This presentation discusses the Plant Data Service (PDS): an open-source, open-access plant data API. It was originally created to support data sharing among the national Cover Crop Councils who identified a need for exchanging data between decision support tools. Reflecting its intent to be used for decision support in cover cropping, the API returns cover crop data based on queries containing geographic information and appropriately references the data for a given SARE region and USDA-defined plant hardiness zone. In the next phase of work, the PDS will be expanded to include a suite of horticultural crops that have the available data desired in crop management use cases.

The presentation will explain the layered architecture of the PDS, the importance of transparent software, and the use of ontologies in structuring data in a semantically meaningful way.

Mentor(s):

Ankita Raturi (Agriculture); Juliet Norton (Agriculture); Steven Doyle (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 710
Presentation Time: STEW 214A at 10:00am-10:20am

Entanglement Distribution on a Photonic Integrated Circuit

Author(s):

Gabriel Alminauskas† (Engineering); Collin Campbell† (Engineering); Runlin Wang† (Engineering)

Abstract:

Quantum technology is becoming an increasingly popular solution in the fields of communication, information processing, and computing, and has many advantages over classical technologies. Compared to electrical equivalents, quantum technology allows for greater processing speeds, smaller device requirements, increased safety of users, and more efficient power consumption. However, as matter-based qubits increase in size, counteracting decoherence becomes challenging, thereby placing limits on the size of standalone systems. Consequently, unleashing the full potential of quantum information processing requires a reliable distribution of entanglement as a resource between distant parties. As such, the performance of these devices should be optimized to allow for effective entanglement on a small-scale device. To accomplish this goal, this research project will determine how to develop a device which will generate entangled particles on a small scale. is project will develop a quantum entanglement swapper and distribution device, which will allow for the testing of individual components, along with a full entanglement distribution circuit. This device - specifically, a silicon Photonic Integrated Circuit (PIC) - will both entangle photons and allow for photon swapping and distribution. By using many fundamental photonic circuit components (such as ring resonators and couplers) which are fine-tuned to the frequency of the medium photon, the PIC will function optimally at the given wavelength. This allows for effective entanglement and distribution of entangled photons. Through this chip, both the Ultrafast Optics and Optical Fiber Communications Laboratory at Purdue, and other laboratories in general, will have a strong understanding of entanglement swapping.

Mentor(s):

Lucas Cohen (Engineering); Andrew Weiner (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 711
Presentation Time: STEW 214A at 10:20am-10:40am

Functional Connectome Identifiability through Tensor Decomposition

Author(s):

Vitor Farias Costa de Carvalho† (Engineering)

Abstract:

The human functional connectome (FC) is a representation of the functional couplings between brain regions derived from blood oxygen level dependent (BOLD) signals. Studying the FC is a promising research area as it enables making inferences about individual characteristics of subjects and their cognitive states based solely on neuroimaging data. Thus, FC data may serve as an identification tool, or brainprint. In this paper, we aim at maximizing functional connectome identifiability by performing tensor decomposition in data acquired from the Human Connectome Project (HCP). We used test-retest fMRI data from 426 unrelated subjects from the HCP dataset. For each subject, test-retest data includes resting-state as well as seven tasks. To analyze such high-complexity data, we structured it into a tensor. We used tensor decomposition to project the data into a lower dimensional space. By doing so, we were able to separate the data into three components. The first two components are related to the cohort-level characteristics of the functional connectomes, whereas the third component captures subject-specific information. We performed our identifiability assessment by computing the correlation between all test-retest pairs of subject-specific information contained in the third component at different rank decompositions. Results show that subjects can be correctly matched with over 80% accuracy across the resting state and all seven evaluated tasks. We also extended this approach by assessing brainprint when resting state is used as test and a task as retest. This multi fMRI condition brainprinting analysis also yielded matching rates over 80% across all comparisons.

Mentor(s):

Ana Estrada Gomez (Engineering); Joaquín Goñi Cortes (Engineering); Mintao Liu (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 712
Presentation Time: STEW 214A at 10:40am-11:00am

An Origami-Inspired Deployable Space Debris Collector

Author(s):

Yuto Tanaka† (Engineering); Aditya Arjun Anibha† (Engineering)

Abstract:

This paper develops a novel approach to design, actuate, and manufacture a space debris collector based on the conical Kresling origami pattern. The deployable nature of origami structures and the radial closability of the conical Kresling pattern are leveraged to form an enclosure volume for collecting space debris at different sizes. We first introduce the geometric, volume, and energy models of the conical Kresling pattern. Based on these models, the debris collector design problem is formulated as a parameter optimization problem to minimize the actuation energy for the folding process while satisfying the minimum volume constraint and geometric/functional constraints. To automatically capture debris in space, an actuation system is designed, which is compatible with space environments. Moreover, the multi-material three-dimensional printing technology is applied to build the designed debris collector, which makes it feasible for manufacturing the product in orbit. The proposed design, actuation, and manufacturing approaches are verified with experimental tests using a designed prototype.

Mentor(s):

Ran Dai (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 713
Presentation Time: STEW 214B at 10:00am-10:20am

Active Herbicide ingredients in Roundup Ready Xtend products, glyphosate and dicamba, results in hypoactivity in zebrafish larvae when exposed during development

Author(s):

Ryker Bond† (HHS)

Abstract:

Glyphosate(GLY) is the most used agricultural herbicide in the United States and the active ingredient in Roundup Ready products. GLY residues are detected in food products and the herbicide can move in the environment after field application, contaminating drinking water sources. Thus, there are multiple exposure routes in the general population in addition to occupational exposure risks in agricultural workers. Due to over application of GLY leading to weed resistance, a second generation of Roundup Ready products were developed that include the herbicide dicamba(Roundup Ready Xtend). Currently little is known on toxicity risks or if increased application will result in drinking water source contamination with dicamba. This study evaluated developmental neurotoxicity of GLY, dicamba, and binary mixtures with a visual motor response behavioral assay using the zebrafish model. Zebrafish were exposed from 1–120-hour post fertilization(hpf) encompassing embryogenesis and early larval development period. GLY concentrations centered around the US regulatory limit in drinking water(700ppb), with single treatment concentrations ranging from 0.7-7000ppb. With no current US regulatory level for dicamba, treatment concentrations ranged from 0.01-1000ppb. Binary treatment concentrations were chosen based on results of the single chemical exposures. Hypoactivity was observed for both herbicides in total distance moved, velocity, and time spent moving in groups exposed to 7000ppb GLY, at concentrations as low as 1ppb dicamba, and in the mixtures of 700ppb GLY/100ppb dicamba and 7000ppb GLY/100ppb dicamba. Overall, this is the first study to evaluate behavioral alterations for dicamba and glyphosate/dicamba mixtures. Further assessments into developmental neurotoxicity risks are needed.

Mentor(s):

Jennifer Freeman (HHS); Vasisht Varsh Sridhar (HHS); Ola Wasel (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 714
Presentation Time: STEW 214B at 10:20am-10:40am

Retrosplenial cortical mechanisms contributions to acquisition of inhibitory avoidance

Author(s):

Michael Kuczajda† (HHS, Liberal Arts, Honors)

Abstract:

Fear is a reactionary emotion that activates in the presence of an immediate threat and can help prompt behaviors that defend the organism from that threat. Exposure to a dangerous event can result in avoidance of stimuli or environments associated with that event. While this is generally an adaptive response, this type of learning can become maladaptive when it generalizes to safe situations that have not been paired with an aversive event. In avoidance learning, an organism learns to avoid a situation or area previously associated with a fearful stimulus or aversive outcome by remaining on the side of a two-compartment chamber that was not paired with shock. Here, we aimed to examine how initial learning that produces avoidance behavior changes activity in the retrosplenial cortex, a brain region crucial for the integration of contextual information with fear learning during memory formation. We used 16 male and female Long Evans rats. Rats were split into two groups: those who received passive avoidance training by having one side of a two-compartment chamber paired with shock (Training), and those who remained in the homecage (Control). Both groups of rats were sacrificed 60-minutes after training neural activity was assessed in the retrosplenial cortex using zif268. These findings show that the retrospleinal cortex was active in response to passive avoidance acquisition. This information can be used to better understand how neural mechanisms impact context-dependent fear and passive avoidance acquisition in humans and can provide insight into how maladaptive fear learning can generalize.

Mentor(s):

Sydney Trask (HHS); Erisa Met-Hoxa (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 716
Presentation Time: STEW 214C at 10:00am-10:20am

Improving Forecasts of U.S. Elections

Author(s):

Ryan Branstetter† (Science)

Abstract:

Forecasting the results of United States elections is an interesting problem that draws on many fields, including mathematics. An existing mathematical approach (by Volkening et al.) based on an adapted disease-transmission model has comparable accuracy to popular forecasters. This model, a system of differential equations, depends on polling data to specify parameter values. Currently, the model treats every poll as equally accurate, but some pollsters are more reliable than others or have dependable partisan leans. This motivates our project: we aim to adjust the polling data to produce better forecasts. To do this, we calculated the average partisan lean of each pollster across their polls from 2004–2020. We tested the impact of three different ways of quantifying pollster partisan lean and then adjusting polling data on the model; FiveThirtyEight's measurements of partisan lean, the measurements of partisan lean that we calculated using all of the polls in our data set, and measurements of partisan lean that we calculated only using polls completed in the last three weeks before an election. After adjusting the polling data based on these different measurements, we generated forecasts of past elections, and we compared these to forecasts using the original method by Volkening et al. For our analysis of the 2020 Senate and governor elections, we find that accounting for partisan lean improves the original method, in which polling data is not adjusted at all. In the 2022 races, we had an average improvement of 0.32, 0.61, and 0.41 percentage points for the three different methods. We had similar results across elections in other years spanning 2012 to 2022. Our results suggest that adjusting the polling data by past partisan lean may be an effective method to improve accuracy.

Mentor(s):

Alexandria Volkening (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 717
Presentation Time: STEW 214C at 10:20am-10:40am

Determining the oncogenic potential of PP2A-B56a in PDAC

Author(s):

Sydney J. Clifford† (Science, Honors)

Abstract:

Pancreatic Ductal Adenocarcinoma (PDAC) is the 4th leading cause of cancer deaths and has one of the lowest five-year survival rates at just 11%. Over 90% of PDAC patients have mutated KRAS yet targeted therapeutics against the most prevalent mutation, KRASG12D, have yet to be FDA approved. Therefore, alternative therapeutic strategies are needed, potentially including cellular pathway targets that regulate KRAS activity.

Protein phosphatase 2A (PP2A) is a tumor suppressive serine/threonine phosphatase that negatively regulates many of the downstream effectors of KRAS, making the activation of PP2A a potential therapeutic strategy. PP2A is a heterotrimeric complex whose function is dictated by the specific subunits incorporated. However, most studies have focused on the PP2A unit rather than the specific complexes, demonstrating a critical need to study specific PP2A complexes.

The PP2A-B56a subunit has been previously implicated as a tumor suppressor in other cancers, but its role remains unknown in PDAC. We have identified a novel role for PP2A-B56a, where activation of the PP2A-B56a complex in human PDAC cell lines resulted in oncogenic phenotypes. Further, a PDAC mouse model with genetic knockout of CIP2A, an endogenous inhibitor of PP2A-B56, surprisingly reduced survival.

To determine if activation of B56a is responsible for the reduced survival in this mouse model, cell lines from this model were generated and will be tested for the same mechanism as found in human PDAC cell lines. These studies will increase our understanding of PP2A-B56a function in PDAC and will lay the foundation for future studies in this area.

Mentor(s):

Brittany Allen-Petersen (Science); Claire M. Pfeffer (Science); Jennifer P. Morton (University of Glasgow); Jukka Westermarck (University of Turku, Turun yliopisto, Finland)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 718
Presentation Time: STEW 214C at 10:40am-11:00am

Analytic Spatial Resolution of the Dark Matter Detecting Windchime Array

Author(s):

Bahaa Elshimy† (Engineering, Science, Honors)

Abstract:

The goal of the Windchime project is to probe the sub-Planckian Dark Matter parameter space as candidate particles interact gravitationally with the enhanced accelerometers of the envisioned detector array. The resolution of this Windchime detector will then be critical in understanding the setup of the experiment. My work is aimed at introducing an analytic solution to the spatial resolution of the complete three-dimensional version of the detector. Linear fitting and error propagation of the sensor measurement uncertainties was performed, and a simple geometrical definition was used to parameterize the system. I show various resolution trends with respect to changing detector configurations and include a discussion regarding the trial factor of the experiment. This trial factor is crucial to understanding the look-elsewhere effect associated with the analysis and it alters the thresholds of detection significance. I also derive a rough correlation function for the resolution based on the analyses performed.

Mentor(s):

Rafael Lang (Science); Juehang Qin (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 719
Presentation Time: STEW 214D at 10:00am-10:20am

Top Quark Entanglement

Author(s):

Nicholas Erikson† (Science); Titus Tse† (Engineering); Aiden Cullen† (Science)

Abstract:

Top quarks have unique characteristics within the standard model. Their mass is significantly higher than other fermions, making them ripe for a lot of quantum mechanical research. Our research aims to try and find entanglement between reconstructed top quarks that have undergone dileptonic decay. We are reconstructing these top and anti-top quarks using particle flow reconstructed data from the compact muon solenoid (CMS). The process of the top quark reconstruction consists of first taking data from CMS and applying some data cuts to its electron and muon data. Taking the cut decay particle data, along with inferred information from undetectable neutrino particles, we are able to reconstruct top quarks with accurate quantum data. From this point, we can then calculate the angle from which the top-antitop pair has separated, which is how we can then check if the pair is in a correlated or uncorrelated state. If the pair is in a correlated state, we have then found a pair of entangled top quarks. We hope to determine the frequency and variety of entangled dileptonic top quark pairs.

Mentor(s):

Andy Jung (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 720
Presentation Time: STEW 214D at 10:20am-10:40am

Synthetic Data Generation for RoboMaster Amor Plate Detection

Author(s):

Xipeng Wang† (Science, Polytechnic Institute); Mengting Xu† (Engineering); Guo Yu† (Engineering)

Abstract:

We present a novel approach to generating photorealistic synthetic data for the RoboMaster competition focused on robot armor plate detection, utilizing state-of-the-art technologies. Large amounts of high-quality data are essential for training accurate computer vision algorithms, but data collection can be a costly and time-consuming task, especially when specific needs for the model change over time. Synthetic data generation offers a solution by allowing the extraction of large amounts of images and metadata directly from a virtual environment, while maintaining precise ground truth annotations. Our pipeline utilizes Autodesk Maya to generate a realistic virtual environment with an extensive randomization framework that can be customized to meet specific needs. We can simulate various scenarios that the object detection model may face by randomizing lighting, scene composition, robot model, and other factors. Models trained on data generated by our pipeline show a significant improvement in precision and generalizability compared to existing methods. Our approach offers a versatile and cost-effective solution for generating large amounts of synthetic data with precise ground truth annotations, providing the basis for developing accurate and robust computer vision models for the RoboMaster competition and other applications.

Mentor(s):

Abolfazl Hashemi (Engineering); Minghao Sun (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 721
Presentation Time: STEW 214D at 10:40am-11:00am

Evaluating the efficacy of IPM strategies against insect pests of collards

Author(s):

Elliott Masterson† (Agriculture); Layton Rosen* (Agriculture)

Abstract:

Insect pests threaten food security worldwide and the FAO predicts up to 40% of crops are lost to insect damage every year. While synthetic insecticides are commonly used by farmers, integrated pest management (IPM) strategies that combine variety selection and organic insecticides are also available but may be underutilized because their efficacy against insect pests is less clear. To address this knowledge gap, we evaluated rotations of synthetic and organic insecticides in tandem with variety selection as strategies against an economically-important group of insect pests in collard production: caterpillars.

Over a 13-week period from June – August 2022 at the Throckmorton-Meigs Purdue Agricultural Center, we scouted replicated plots of collards (var. flash, champion, and top bunch) and recorded the number and identity of caterpillars on plants of each variety when subjected to rotations of synthetic + organic, organic-only, or no insecticides. We also recorded yield across varieties and treatments on six dates. We found 4 caterpillar species feeding during the season but observed no differences in damage between collard varieties. Synthetic + organic and organic-only rotations suppressed caterpillars equally well, and these plots had significantly fewer caterpillars than untreated plots for the majority of the season. At final harvest, we found that collards var. flash had significantly higher yields than var. champion or top bunch, and regardless of variety, yields were significantly higher in the synthetic + organic rotation. Our results demonstrate that organic products alone can be just as effective against caterpillars as a rotation of synthetic and organic products.

Mentor(s):

Elizabeth Long (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 722
Presentation Time: STEW 214A at 11:00am-11:20am

THE IMPACT OF LACTATION ON PREGNANCY-INDUCED CARDIAC HYPERTROPHY DURING POSTPARTUM IN MICE

Author(s):

Kyndall Davis† (Engineering); Arden Shen‡ (Engineering); Charlotte Cleary‡ (University of Minnesota); Gracine Sime‡ (Engineering, Honors)

Abstract:

As the heart attempts to support both mother and fetus, pregnancy-induced changes in some patients lead to cardiovascular dysfunction. This contributes to about 50% of all pregnancy-related deaths up to one year after delivery in the United States. Despite its incidence, cardiovascular changes during pregnancy and postpartum are understudied and oversimplified, with many studies using postpartum as a control. Factors such as lactation status greatly affect the hormones and hemodynamic changes proposed to drive heart growth in pregnant rat models. Consequently, we examined the impact of lactation on the heart in postpartum mice models. We hypothesized that lactation would drive additional cardiac hypertrophy due to elevated hormonal and mechanical loading after delivery, while non-lactating mice hearts would regress towards pre-pregnant size. In this study, we tracked changes in left ventricular size and shape using serial four-dimensional cardiac ultrasound (4DUS) measurements throughout pregnancy and postpartum to investigate cardiac growth. 4DUS scans were segmented and metrics of cardiac morphometry and function were calculated using a custom-built graphical user interface. Ventricular mass and stroke volume increased during pregnancy in all mice. This growth continued throughout postpartum in the lactating mice, while the nonlactating mice showed reverse growth toward pre-pregnancy values. Our findings suggest that lactation continues to drive cardiac hypertrophy postpartum, possibly due to differences in hemodynamics and hormonal levels compared to non-lactating mice, accentuating the complexity of the postpartum period and highlighting the significance of maternal care after birth.

Mentor(s):

Craig Goergen (Engineering); Kyoko Yoshida (University of Minnesota); Jennifer Anderson (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 723
Presentation Time: STEW 214A at 11:20am-11:40am

Tape Peel Adhesion on Soft Substrates

Author(s):

Rebecca Jennings† (Engineering, Honors)

Abstract:

Pressure sensitive adhesives (PSAs) are critical in medical devices that require adhesion to the skin. One example of these devices is that of a colostomy bag that must be regularly changed to empty the contents of the bag. These devices not only must withstand the stressors of everyday life but must also be removed by peeling without injury or affliction of pain to patients. Our work focuses on understanding the fundamental mechanics of peeling from skin-analog soft substrates to better optimize adhesive properties for removal. These results will inform the creation a mathematical model for more optimized adhesive fabrication based on the substrate-adhesive system under investigation. Utilizing a 90° peel testing method, we observed a proportional relationship between the substrate modulus and work of detachment which is the energy required to remove the PSA tape from a given skin analog surface. There was also characteristic out of plane deformation that forms during soft substrate tape peel and was quantified through image analysis. Quantifying these experimental observations serve as the basis for building the mathematical mechanics model. From this, adhesion scientists will be better informed to optimize medical adhesives for specific applications and mitigate damage to patient skin surfaces.

Mentor(s):

Chelsea Davis (Engineering); Jared Gohl (Engineering); William Zummo (Engineering); Adrian Defante (Hollister)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 724
Presentation Time: STEW 214A at 11:40am-12:00pm

How strong are Low Temperature Solders (LTS) in Microelectronics?

Author(s):

Surya Perla† (Engineering, Honors)

Abstract:

Solders are a vital component of microelectronics. They act as electrical and mechanical connections across various components within microelectronic packages. These solders must be strong and resilient to thermal and mechanical stresses. While lead-based solders were used in the past, there has been a major shift towards using alternative alloy compositions due to the toxicity of lead. One such alternative alloy composition is the tin-based Sn-Ag-Cu system. However, these systems have high melting points. This induces warpage and, eventually, failure of the packages during the solder reflow process. To mitigate this, low temperature solder (LTS) systems are being considered. The objective of this collaborative study was to conduct different types of mechanical tests (monotonic, creep and fatigue) on LTS systems with varying compositions of microalloys to capture the mechanical behavior of solder joints. In this study, each microalloy with a different composition was soldered against two small printed circuit boards (PCBs). Then they were put in a mechanical tester which conducts a shear load on the solder joint and measures the strain displacement. The mechanical stress and strain curves of each microalloy solder were analyzed to understand the strength of the material at a given shear load. Furthermore, a new updated custom micro-precision mechanical tester is being developed in this study to test LTS alloys efficiently. Findings from this study suggest that with an improved characterization of the constitutive behavior of LTS systems, we can effectively identify potential alternatives of low temperature, lead-free solders for microelectronic applications.

Mentor(s):

Ganesh Subbarayan (Engineering); Sukshitha Puttur Lakshminarayana (Engineering); Sean Lai (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 725
Presentation Time: STEW 214B at 11:00am-11:20am

Child Automated Speech to TExt

Author(s):

Anish Bhowmik† (Science); Daniel Zheng† (Engineering); Aadya Pawar† (Science); Jasper Koliba‡ (Engineering); Reagan Becker‡ (Science); Aarini Panzade‡ (Science, Honors); Brian Ha‡ (Engineering); Aarohi Panzade‡ (Science, Honors); Aakanksha Shripal‡ (Engineering)

Abstract:

Abstract Redacted.

Mentor(s):

David Purpura (HHS); Avery Closser (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 726
Presentation Time: STEW 214B at 11:20am-11:40am

Role Differentiated Bimanual Manipulations During Naturalistic Infant Play in the Home

Author(s):

Tatum Neal† (HHS); Ashley Hartman† (HHS, Honors); Jenna Chesterman† (HHS)

Abstract:

As infants progress through the stages of development, the ways they interact with objects changes. One type of object interaction is Role Differentiated Bimanual Manipulation (RDBM) is which each hand works together to achieve a goal and where each hand plays a different but complementary role. During RDBM, one hand is used to stabilize an object while the other hand is used to manipulate it. Previous studies regarding RDBM occurred in structured settings where infants were given objects that required RDBM, and the intended actions were demonstrated. No current studies examine RDBM in naturalistic settings or assess the impact an infant's posture has on RDBM. For our project, we examined 13- and 24-month-olds engaging in RDBM in a naturalistic home setting. A researcher visited the participant's home and recorded an hour-long video of the child and parent during their every-day activities. We used Datavyu, a video coding software, to examine these videos and code instances of object manipulation and RDBM. For object manipulation, we coded any instance an infant was manipulating a toy with their hands, which could be either unimanual or bimanual. For instances of RDBM we coded the infant's position (sitting, standing, or walking), the size of the object (small, medium, or large), if the infant stabilized or manipulated the object first, and which hand the infant used for each role. Our findings contribute to understanding how often infants use RDBM in a naturalistic setting compared to unimanual and bimanual movements and the factors that influence these interactions.

Mentor(s):

Laura Claxton (HHS); Paige Thompson (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 727
Presentation Time: STEW 214B at 11:40am-12:00pm

Patient, family, and provider experiences with advance care planning in Parkinson's

Author(s):

Aubrey Parr† (HHS)

Abstract:

Parkinson's is a progressive illness with cognitive and communication impairment, yet advance care planning (ACP) is not part of usual care. This study explored experiences in ACP communication and identified barriers and facilitators. Behavior change theory, which places importance on interactions between patients, caregivers, and clinicians as central to ACP behavior change, was used to develop the qualitative interview guide and determine the sampling strategy. Variables that influence ACP behaviors include roles in decision making, past ACP experiences, health status, knowledge, beliefs, barriers, and ACP skills. Participants, 9 patients, 12 caregivers, and 12 providers, completed a one-hour semi-structured interview through qualitative descriptive methods, with probes about the variables in the ACP behavior change theory, on their experiences with ACP communication and planning. Content analysis extracted barriers and facilitators, types of documentation completed, and roles in ACP communication. Participants indicated the importance of and their willingness to engage in ACP. ACP discussions focused on quality in life, not specific end of life decisions. Barriers included denial, avoidance, resistance from the patient or family, and cognitive decline. Facilitators included personal interest in ACP, past ACP experiences, and wanting to explain wishes to family. 48% of patient and family caregiver participants had completed ACP documentation. ACP was primarily initiated by patients and caregivers outside of the medical system. Although barriers to ACP communication exist, there is willingness to engage in ACP conversations. Clinical providers are rarely involved, so providers can engage in more ACP conversations in with Parkinson's patients and their caregivers.

Mentor(s):

Jiayun Xu (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 728
Presentation Time: STEW 214C at 11:00am-11:20am

Maternal education and child sleep problems: Are they associated in families raising children with autism?

Author(s):

Miriam Rimawi† (HHS)

Abstract:

There is limited research investigating the relationship between socioeconomic factors (e.g., maternal education level) and sleep in children with autism. Within this secondary data analysis study, we examine the association between maternal education (a socioeconomic resource) and sleep quality in children with autism. Based on previous studies, we expected children with fewer socioeconomic resources will have less optimal sleep.

The 40 children in this study ranged from 2 to 10 years of age. Mothers were categorized based on their highest level of education into one of two groups: college and above or below college. Child sleep was assessed with the Children’s Sleep Habits Questionnaire (CSHQ) with scores > 41 indicating a higher likelihood of a significant sleep problem.

Of the 40 children in the study a total of 32, or 80%, had CSHQ scores > 41. Of these 32 children, 22 or 69% had parents within the below college group. A Pearson chi-square test was completed - X2 (1, n = 40) = 5.10, p = .02. Thus, the null hypothesis that maternal education status and child sleep disturbances are independent can be revoked, and there is sufficient evidence to conclude that maternal education status and CSHQ values are associated in this sample of families raising children with autism.

Mentor(s):

AJ Schwichtenberg (HHS); Emily Abel (Wabash College)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 729
Presentation Time: STEW 214C at 11:20am-11:40am

Identifying Health Equity Language in Pharmacy Residency Programs through Analysis of Promotional Content

Author(s):

Sarah Vas† (Pharmacy); Jessica Schowe‡ (Pharmacy); Jasmine Reyes* (Pharmacy); Taylor (Kenedie) Krout* (Pharmacy)

Abstract:

Methods:

A list of all accredited post-graduate year one (PGY-1) programs was created using the American Society of Health System Pharmacists Residency Directory, yielding 1535 programs. A random sample was generated from this list by selecting 20% of residencies from each state. The sample was split in half and each half was reviewed by two student pharmacists. Each program's residency and health system's website and promotional materials were thoroughly reviewed for language referencing HE and SDOH. Researchers documented any language found insinuating HE and SDOH with a numerical score of "1" or "0" indicating the presence or absence of information. The reviewer pairs performed a cross-analysis to verify and increase validity of words identified and scoring. Locations of the health systems were documented, in order to identify whether or not the programs were within medically underserved areas (MUA).

Results:

A total of 318 programs met inclusion criteria. Of the reviewed programs 29% included language related to health equity within the overview, rotation descriptions, preceptor biographies, or other website sections. Sixty-eight percent of the overarching health systems incorporated equity language in their mission, vision, values and/or diversity, equity, and inclusion (DEI) statements. When specifically assessing PGY-1 descriptions, excluding mission and DEI statements, 25% of programs included HE or SDOH language.

Conclusion:

A majority of PGY-1 programs lacked language identifying their focus and work around HE or SDOH within their residency promotional materials.

Mentor(s):

Monica Miller (Pharmacy); Rakhi Karwa (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 731
Presentation Time: STEW 214D at 11:00am-11:20am

Effects of Gut Microbiome on Spontaneous Osteoarthritis

Author(s):

Anisha Rath† (Engineering); Noah Jasinkiewicsz‡ (Engineering); Jenna Brual‡ (Engineering)

Abstract:

Osteoarthritis (OA) is one of the most prevalent musculoskeletal diseases and often targets the hip and knee joints. Knee OA has been associated with joint pain, muscle atrophy, and an overall health reduction in quality of life. Age is a known risk factor for its development. Additionally, the gut microbiome participates in many physiological processes and alters systemic inflammation, which is also related to OA progression. This study examines the potential role of the gut microbiome and spontaneous OA, and its corresponding bone morphometry and microarchitectural changes in aged populations of mice specimens specifically looking at the incidence rate. The treatment groups include continuous dosing, delayed antibiotics dosing of antibiotics, and initial antibiotics dosing. This was followed up by fecal microbiome transplant that will be compared to age matched controls. Micro-Computed Tomography will observe the effects of these four treatment groups on bone morphometry in the murine left knee joint. We will analyze a region of interest containing the proximal and distal epiphyses of the femur and tibia, respectively. We will conduct statistical analysis to ascertain any differences between treatment groups in their spontaneous OA development. This can identify whether the effects of alteration to compositions of the gut microbiome in aged mice alter the progression of OA. By conducting this study, we will be able to compare two groups and evaluate if there is a difference between aged mice and the various treatment groups in the tibial epiphyseal trabecular bone and subchondral plate.

Mentor(s):

Deva Chan (Engineering); Cameron Villarreal (Engineering); Zachary Davis (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 732
Presentation Time: STEW 214D at 11:20am-11:40am

Post Pandemic Hybrid Work: Research and Application

Author(s):

Joshua Reilly-Grim† (Management, Honors)

Abstract:

This study is aimed to analyze students' productivity, specifically of the Larsen Leaders Academy of Krannert School of Management at Purdue University. The time frames surveyed via Qualtrics are before, during, and after the COVID-19 pandemic (circa February 2020, February 2020 to August 2021, and August 2021 to the present day). Factors measured include working mediums (% of in-person, hybrid, online work), physical health, mental health, spiritual health, scholarly changes (major, minor, study abroad, etc.), extracurriculars/leadership, and internships. Goldberg’s Big 5 Forces and Gallup’s StrengthsFinder are incorporated into the survey to see how the character traits of the students affect productivity during these time frames and directly to the factors mentioned above. The report also includes a leadership effect report with the Griswold Internship Program. Questions asked and discussed on this end are: while considering the impact of work post-pandemic, how can client preparation work, student application/recruitment, client development, and overall semester scheduling be improved? The demographics of students are also considered with these effects.

Mentor(s):

Lindsay Rosokha (Management); Olga Senicheva (Management)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 733
Presentation Time: STEW 214D at 11:40am-12:00pm

Business Employer Perspectives on New Hires' Information Literacy Needs in the Workplace

Author(s):

Jiahong Wang† (Management)

Abstract:

Information literacy is essential for business students preparing to move into employment after graduation. Students must be ready for any workplace information literacy tasks and possess specific information literacy abilities, such as locating, using and managing information. The goal of the study is to investigate the expectations and perceptions employers of undergraduate business hires have in terms of new employees' capacities to locate and utilize the information at work, as well as employer perceptions of digital badges. We interviewed four employers who hire Daniels School of Business graduates to gather this information. Each interviewee watched a 45-minute online information literacy module and participated in a 45-60 minute Zoom interview about their perception and expectation for the information literacy skills of new graduate hires, as well as their perceptions of the module's content and digital badges. We recorded the interviews, but only kept and transcribed the audio files. The interview asked questions regarding specific information sources used, information tasks completed, and information challenges faced by new hires.

The study's research questions were:

What are employer perceptions of information literacy skills/needs of business graduate new hires?

What are employer perceptions of micro-learning/digital badging/micro-credential modules and approaches?

After we gathered the data, we read over the transcripts multiple times to gain a thorough understanding. We then performed qualitative analysis to identify the major themes. The findings serve as a basis for further study in this field and will guide the creation and revision of curriculum to better prepare students for the workforce.

Mentor(s):

Heather Howard (Libraries); Margaret Phillips (Libraries)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 734
Presentation Time: STEW 214A at 12:00pm-12:20pm

Perceptions of Artificial Intelligence in Higher Education: A Case Study of Purdue University Liberal Arts Professors

Author(s):

Jack Blair† (Engineering); Jing Gao† (Science, Honors); Kian Kishimoto† (Science)

Abstract:

Advances in artificial intelligence (AI) technology have the potential to revolutionize the educational system by supporting personalized learning, automating grading, and improving administrative tasks. However, the trend accompanies concerns toward the application of AI in higher-level educational institutions. This research investigates Purdue University liberal arts professors' reactions and perspectives of AI in the educational system, particularly their perceived benefits and concerns. In the process of the interviews, professors presented their initial opinions and knowledge of AI technologies, then were shown demonstrations of the cutting-edge technologies, and judged based on their reactions and responses. The research findings suggest that while a portion of Liberal Art College professors have a general understanding of what AI is and its potential capabilities, they were unable to identify specific tools or explain how AI could be directly applied in the classroom. Overall, the interviewed group expressed very polarized reactions to a demonstration of what free AI technologies can currently accomplish. The outcomes from this research will inform critical policy decisions and strategies for the implementation of AI in higher education, and contribute to the ongoing discussion on the integration of AI in the educational system.

Mentor(s):

Heidi Fahning (Honors); Mae Artang (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 735
Presentation Time: STEW 214A at 12:20pm-12:40pm

Monon Neighborhood Livability Study

Author(s):

Abby Dimmick† (Management, Honors)

Abstract:

This livability study is a comprehensive investigation into the Monon Neighborhood’s well-being in order to support evidence-based decision making at the city level and by the Faith Community Development Corporation. We aim to provide a holistic picture of the livability of the Monon Neighborhood, located in Lafayette, Indiana, by understanding the factors that make up well-being for the residents of the neighborhood. We have gathered information about each of these factors from sources including interviews with residents, oral histories, neighborhood and property condition surveys, census data, and other data sets, especially the Polk Directory.

Presently, this livability study has highlighted several areas for necessary improvement, including the opportunity for planting new key resources and community assets in more centrally available areas. Additionally, the mapping of property conditions within the neighborhood has led to key insights about the zones in need of focused improvement. Some practicable goals set by the implications of this study include the generation of a neighborhood association, an increase in resident retention, and identification of physical areas of improvement within the city that future funding could solve. In turn, the existence of this livability study will ideally be used as an asset for neighborhood development, allowing for improvements in each of the stated factors, subsequently improving the Monon Neighborhood as well as Lafayette, Indiana as a whole.

Mentor(s):

Jason Ware (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 736
Presentation Time: STEW 214A at 12:40pm-1:00pm

"Students in Action": College Students' Experiences in Facilitating Middle and High School Students' Community Projects

Author(s):

Haley Zeri† (HHS, Honors); Nikhil Gloyeske† (Science, Honors); Ethan Guardado† (Liberal Arts, Science, Honors); Ian Heinig‡ (Science, Honors); Daniel Hiller‡ (Engineering, Honors); Michael Reisinger‡ (Science, Honors); Harris Collins‡ (Liberal Arts, Management, Honors)

Abstract:

Service projects are an avenue towards establishing belonging and especially important for younger generations who determine the future of communities. Multiplying Good: "Students in Action" is a program implemented within American schools to address this need. Advisors, typically teachers, help middle-school and high-school students create service projects based on the community's needs and their interests. However, there is inevitably a generational disconnect between advisors and students. We are investigating the ability to close this gap by inserting seven college-student coaches with varying experience in community involvement into five local schools and recording their experiences. Thus far, we've observed that student coaches serve as a resource organically defined by the needs grade-school students express verbally or implicitly and create a new atmosphere which encourages the students in their projects. Additionally, the overall utility of college student coaches is influenced by the progress, experience, and pre-existing group cohesion within the individual groups. This level of variability by school suggests the need for flexibility within the college student coach role to best fit the needs of the group. Despite this variability, all schools demonstrated benefits from college student coaches according to feedback from advisors and grade-school students. Additionally, a city-wide service project is accelerated through connections between the college student coaches themselves and their respective groups, providing a new opportunity for all to work together within their greater community towards a common goal. We are continuing to research the degree of our roles' utility and how it is nuanced within the individual schools.

Mentor(s):

Jason Ware (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 737
Presentation Time: STEW 214B at 12:00pm-12:20pm

Neuroimaging Approaches to Identifying PFAS-Induced Increased Risk for Psychosis

Author(s):

William Mahoney† (HHS)

Abstract:

Psychosis is a disorder prevalent in the population throughout human history. Recent studies suggest that psychiatric diseases involving psychosis cannot be explained solely by genetics and that environmental exposures to plastics likely have a role in psychosis risk. Per- and poly-fluoroalkyl substances (PFAS) are manufactured chemicals used widely in industrial and consumer products. They are highly persistent in the environment, accumulate in people's bodies, and can ultimately impact the delicate balance of neurotransmitters in the brain. In this study, we examined how exposure to PFAS and gene-environment interactions influence the risk of neurological disease to help determine whether those with high PFAS levels should be monitored for heightened psychosis risk.

In vivo studies were conducted at the Purdue MRI facility using a Siemens Prisma 3T MRI scanner with a 32-channel head coil. Fifteen subjects participated in this study. Two voxels of interest were manually centered in the posterior cingulate and hippocampus. Subjects provided blood samples measuring PFAS concentrations. Neurochemicals were quantified with an LCmodel (S. W. Provencher, 2001).

Expecting if one group had higher PFAS levels we would observe different neurochemical concentrations, we compared GABA and Glutamate values per brain region between groups. We hypothesized that lower levels of GABA are associated with many psychotic disorders, and we observed lower GABA values across one group.

This study demonstrates that trends are apparent, but there is not enough data to draw specific conclusions. We are recruiting more subjects to investigate the PFAS and gene-environment interactions influencing the risk of psychosis predisposition.

Mentor(s):

Uzay Emir (HHS); Jason Cannon (HHS); Dan Foti (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 738
Presentation Time: STEW 214B at 12:20pm-12:40pm

Advance Care Planning Across Adulthood

Author(s):

Rachel Mendez† (HHS, Liberal Arts, Honors)

Abstract:

Advance care planning is a healthcare decision making process in which a person prepares their medical wishes in the event that they are incapacitated. Plans are established regarding topics such as artificial nutrition, ventilation, comfort, and other end of life processes. Studies have shown that people have differing levels of knowledge and comfort with advance care planning. 80-90% of adults 60 and older have some knowledge of advance care planning, but less than 40% have made specific plans (Grant, 2021). Middle-aged adults have often been excluded from the literature unless they have a chronic illness, while young adults feel uneducated about the topic.

There are many reasons for the lack of advance care planning discussions, including awareness of advance care planning and avoidance of thinking about themselves or their loved ones in declining health. Cultural taboos about death and dying could also prohibit some from advance care planning, while others may not feel ready to make future plans (Mullick, 2013).

It was this survey's intention to identify common barriers and to pinpoint an age at which adults make advance care plans. Notably, planning begins around age 50 with roughly half of the participants indicating they have advance care plans. The 45% of individuals without advance care plans indicated they felt uncertain of the care they would want at the end of life. More people (69%) reported plans for their bodies after death, suggesting social implications of planning for aging and becoming sick exist.

Mentor(s):

Jessica Huber (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 739
Presentation Time: STEW 214B at 12:40pm-1:00pm

Can feeding a bifido bacteria that readily digests lactose and galactooligosacharides improve lactose digestion and tolerance through alteration of the microbiome?

Author(s):

Olivia Moreno† (Science)

Abstract:

Lactose maldigestion, the inability to fully digest lactose, is a normal mammalian trait caused by the genetically controlled post-weaning reduction of intestinal lactase. This developmental reduction in activity can result in intolerance symptoms such as flatulence, bloating, stomach discomfort, and fecal urgency after lactose maldigesters consume dairy products. Microbiome adaption of intestinal bacteria is an alternative pathway to digest lactose. The purpose of this study is to determine if the consumption of Bifidobacterium adolescentis IVS-1, a naturally occurring bacteria known to digest lactose and galactooligosaccharides, will improve digestion and tolerance of lactose by altering the gut microbiome. Participants are selected based on a preliminary screening and a 2-3 hour hydrogen breath test (HBT) conducted after ingestion of 8oz. of 2% fat milk. Participants are blindly divided into a control group (cellulose capsule ingestion) and an experimental treatment group (bifidus capsule ingestion). All participants refrain from dairy for the first 28 days and rate symptoms related to lactose intolerance for 43 days. On days 14 and 28, participants consume food-grade lactose (0.5g lactose per kg body weight) dissolved in water before completing an 6-hour HBT. Stool samples are collected 3 times throughout the study. The current study is in progress in the laboratories of professors Savaiano and Cross. Human subject recruitment is underway. We expect that the bifido bacteria will alter the intestinal microbiome. Whether or not it improves lactose digestion may depend on the presence of lactose or a prebiotic such as galactooligosaccharide in the diet.

Mentor(s):

Dennis Savaiano (HHS); Tzu-Wen Cross (HHS); Tracy Eaton (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 740
Presentation Time: STEW 214C at 12:00pm-12:20pm

Changes in daily patterns of physiological measures of heat stress on sows in cool room and in heated room with and without a cooling pad.

Author(s):

Jemima Baributsa† (Agriculture)

Abstract:

Impacts of heat stress (HS) on lactating sows during the summer causes challenges in production. The study objective evaluated the daily patterns of common HS measures on late lactation sows. Sows in a HS environment, on and off electronic cooling pads (ECP), were compared to sows in a cool room (CR). From a sample of six sows, three sows were assigned to a HS environment, (31°C daytime for 6 h and 26°C nighttime for 5 h) with an ECP (n=1) or without an ECP (nECP, n=2). Three sows were placed in a CR (n =3) with set temperature of 20°C. The ECP automatically flushed 2.0 L of cool water (18 to 19°C) when one of three temperature sensors reached 26°C. Flushing occurred for 30 s replacing 1.73L of water in the ECP. All sows were in farrowing crates and provided ad-libitum access to feed and water. Internal Temperature (TI) was measured in 10-minute intervals using vaginal implants. Skin temperature (TS) was measured hourly, using an infrared gun 10 cm behind the ear. Respiration rate (RR) was observed in 30-minute intervals from 0600 - 2200 over 2 days. Mixed model periodic regressions were performed in R, fitted to the RR, TS, and TI data. Daily increases in RR and TI were greater for sows in the HS environment compared to the CR, or the sow on the ECP. Overall, the ECP reduced TI on average by 0.39°C with the greatest impact of 0.8 to 0.9°C from 1500 - 1900.

Mentor(s):

Allan Schinckel (Agriculture); Robert Stwalley (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 741
Presentation Time: STEW 214C at 12:20pm-12:40pm

Comparative analysis of Enterotoxigenic Escherichia coli F4 and F18 strains adhesion on porcine intestinal epithelial cell line IPEC-J2

Author(s):

Chenhai Li† (Agriculture)

Abstract:

E. coli are the major culprit for colibacillosis (signed by diarrhea) in young piglets from birth to post weaning. Three representative colibacillosis causing Escherichia coli strains were isolated from swine rectum in farms from Iowa and Maryland. All isolates were β-hemolytic F18 enterotoxigenic E. coli (ETEC). Whole genome comparison of 3 F18 strains (3EC1, 27EC1, and 3247EC) with ETEC F4 reveals differential genomic attributes associated with flagellin, fimbriae and LPS biosynthesis. There is a clear etiology difference between F4 and F18 strain: F4 is most prevalent wit neonatal diarrhea whereas F18 is more common in postweaning colibacillosis. To mimics the intestine epithelium of weaning and postweaning piglets, we measured the bacterial adhesion on young (6 days) and old (9 days) porcine intestinal epithelial cells (IPEC-J2). Although ETEC F4 strain still demonstrate the highest adhesion rate from all maturity level, it demonstrates significant reduction in adhesion on aged epithelium. On the contrary, F18 strains maintain similar adhesion rate on epithelial cells grown for different days. In addition, F4 strains demonstrates stronger cytotoxicity that stimulates rapid epithelial turnover which could lead to loss of brush boarder in older epithelial cells, making the epithelial surface unfavorable for colonization. These findings reveal the virulent determents for ETEC colonization strategies and offers insights in developing more effective therapeutics measures.

Mentor(s):

Arun Bhunia (Agriculture); Dongqi Liu (Agriculture); Nathan Horn (United Animal Health)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 742
Presentation Time: STEW 214C at 12:40pm-1:00pm

Examing Peer and Self-Assessment of Engagement in a Group Case-based Learning Scenario in an Introductory Animal Agricultural Course

Author(s):

Jessica Proctor† (Agriculture)

Abstract:

Student’s interactions with each other can impact student engagement in courses and this may ultimately influence their performance. The objective of this study is to explore how working with peers in a collaborative-learning environment influences their experience on a course assignment. Peer and self-assessments were administered to students enrolled in an introductory animal science course (92.0% response rate; n=95) after students completed a collaborative case-based learning scenario. The case study aligned with the prior lecture and students were allotted 40 minutes to work with their peers to apply their knowledge and form ideas on how to approach each scenario. While students worked in groups of 5 or 6, ten of the groups were audio recorded for conversation analysis. The conversational analysis will be completed in March and will inform the data on what students found most helpful or if there was conflict present. After they completed the case scenario, students completed the peer and self-assessment. The assessment was created and validated for the purposes of this experiment, and students self-reflected on their personal contributions and group perspective using a 6-point Likert Scale. The majority of students reported a willingness to work with their group of peers again and felt they worked will with their peer group to accomplish the task. Analysis is ongoing, but we anticipate that the results from this working environment for students.

Mentor(s):

Elizabeth Karcher (Agriculture); Elizabeth Ragland (Agriculture); Brianna Wardwell (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 743
Presentation Time: STEW 214D at 12:00pm-12:20pm

Exploring the Electrophysiological properties of Cortical Spheroids Carrying an Epilepsy-Linked SCN2A Mutation

Author(s):

Muhan Wang† (Pharmacy); Hope Harlow‡ (Pharmacy); Conrad Otterbacher‡ (Science)

Abstract:

Recent research has indicated that mutations in the SCN2A gene can cause epilepsy. SCN2A gene encodes the voltage-gated sodium channel Nav1.2, a protein responsible for maintaining neuronal action potentials. One of the recurrent mutations, L1342P, has been identified in several patients worldwide, and leads to severe seizures that are difficult to treat using standard medications.

In this project, we used CRISPR-Cas9 edited human induced pluripotent stem cells (hiPSCs) carrying the L1342P mutation to generate a cortical spheroid model. Our goal is to gain a better understanding of the electrical properties associated with the mutation.

We used electrophysiological techniques to evaluate the electrical activity of the generated cortical spheroid neurons. Patch-clamp and multi-electrode array (MEA) were used to record the electrical activity of single neurons and populations of neurons from the generated cortical spheroids, respectively. Patch-clamp measured the membrane potential, current flow, number of action potentials, and maximum action potentials of each neuron firing. In contrast, MEA non-invasively measured the excitability of the entire organoid's neuronal population. We hypothesized that cortical spheroid neurons carrying the mutation would exhibit greater electrical activity than those without the mutation. Our Preliminary data indicates that the mutation results in (1) hyperexcitability, (2) reduced rheobase, (3) reduced rise time, (4) increased mean firing frequency, and (5) increased

burst number in the L1342P neurons compared to the control groups without the mutation. Our results provide insight into how the mutation affects neuronal excitability and present a platform suitable for testing therapeutic interventions to advance personalized precision medicine.

Mentor(s):

Yang Yang (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 744
Presentation Time: STEW 214D at 12:20pm-12:40pm

Gas Phase Studies of Symmetric Viologen-Based Host-Guest Complexes

Author(s):

Danny Hristov† (Science, Honors)

Abstract:

Viologens are molecules that contain a bipyridine center and alkyl substituents on the terminal sides of the bipyridine rings. These molecules have different colors in solution depending on the charge state of the bipyridine core, which makes them suitable for preparing electrochromic devices. To increase their electrochemical performance and solubility, viologens are incorporated into “host” molecules such as cucurbiturils. Cucurbiturils are cyclic sugar polymers that accommodate viologen inside their inner cavity and form an ion-dipole interaction with viologen cations. Measurements of inherent stability of such host-guest complexes are challenging due to interference from solvation. An approach to study the strength of the host-guest complex is to analyze them in the gas-phase under vacuum using mass spectrometry. Here, the strength of the host-guest complex is probed by measuring the energy required to fragment the complex after collision with background gas. We analyzed cucurbituril 6,7, and 8 with benzyl, methyl, and heptyl symmetric viologens. In addition to measuring the strength of the complex, the analysis of the different product ions formed provide insights to bonds of the complex. Preliminary results indicate that larger hosts form more stable complexes with viologen guests. We observed that the host guest complex can undergo two competing processes: alkyl chain loss from viologen or the dissociation of the complex, preferred for viologens with shorter alkyl chains which do not extend out of the protecting structure of the host. This technique can provide insights to the properties of viologens in the solution and gas phase for further applications.

Mentor(s):

Julia Laskin (Science); Hugo Samayoa-Oviedo (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 745
Presentation Time: STEW 214D at 12:40pm-1:00pm

Fluo-4 Calcium Imaging of human-induced pluripotent stem cell-derived cortical neurons carrying a Voltage-Gated Sodium Channel Nav1.2-L1342P Genetic Variant

Author(s):

C. Max Otterbacher† (Science); Muhan Wang‡ (Pharmacy)

Abstract:

The SCN2A gene encodes for voltage gated sodium channel Nav1.2, a protein essential in regulating neuronal activity. Mutations in this gene can lead to epilepsy, a condition characterized by recurrent and sudden seizures, a variant of this gene known to cause epilepsy in patients is L1342P. Calcium imaging is a tool used that indirectly measures neuronal activity both in vitro and in vivo. This practice is rooted in the foundation that intracellular calcium levels rise when action potentials are generated. Changes in calcium levels are indicated via fluorescent calcium dyes, namely Fluo-4, which we use to draw conclusions regarding our cells' excitability and activity. To elucidate the mechanism behind the variant, we have performed Fluo-4 calcium imaging experiments on cortical neuron monolayers, and cortical spheroids derived from CRISPR-Cas9 edited human induced pluripotent stem cells (hiPSCs) carrying the mutation of interest. We hypothesize that both cortical neuron monolayers and organoids carrying the L1342P mutation will exhibit higher calcium dynamics compared to controls, suggesting elevated neuronal activity. Our preliminary results indicate that in both disease models, we have enhanced frequency and synchronicity of calcium events, which recapitulate the neuronal hyperexcitability present in epilepsy patients.

Mentor(s):

Yang Yang (Pharmacy); Maria Olivero-Acosta (Pharmacy); Zhefu Que (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 746
Presentation Time: STEW 214A at 1:00pm-1:20pm

Enhancing Structural Performance of Recycled Fiber-Reinforced Thermoplastic Composite Part Using Recycled Composite Laminate Cutouts

Author(s):

FNU Archie† (Polytechnic Institute); Minjing Zhao‡ (Polytechnic Institute)

Abstract:

Composite recycling is getting more attention along with increasing global sustainability problems. The mechanical recycling process of fiber-reinforced composite parts transforms long continuous fiber in the composite part into a discontinuous short fiber. Since the performance of the short fiber is no longer as high as the long fiber, the application of the mechanically recycled composite is limited. In this research, 2D recycled laminate cutout was used to reinforce the local area, where structurally critical, molded with recycled composite. The remained continuous fiber in the cutout reinforces the structural performance of the part while the recycled composite pellets adhere to the cutouts and fill the rest of the part. As a part of geometry, an overhead pin bracket was designed and used. The composite laminate was made of 60% weight of carbon fiber reinforced PEKK. The 2D cutouts were designed with consideration to its flow during the molding process to ensure that the continuous fiber was located where required. Three different cutout combinations were used to make the pin bracket, and the performance of the pin bracket was evaluated by peak stress during the tensile test and compared to a bracket without the cutouts. Digital image correlation (DIC) technology was used to investigate local strain change and failure mechanism of the parts during the test. The test result showed that the properly designed precut improved performance of the recycled part.

Mentor(s):

Garam Kim (Polytechnic Institute); Eduardo Barocio (Purdue University)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 747
Presentation Time: STEW 214A at 1:20pm-1:40pm

Maximizing Efficiency in Biowall Design: watering system

Author(s):

Siqi He† (Polytechnic Institute)

Abstract:

The design, construction, and installation of a new biowall for West Lafayette Public Library is in progress. The biowall has four trays that houses various NASA-recommended plants like pothos, snake plants, and ivy to filter indoor air. To evenly water all four trays, which were divided in two levels, two upper water tanks have been installed. A drip irrigation system delivers water to each tray via ¼ inch water hoses, which have been divided using "T" joints and small hoses to achieve optimal distribution.The hoses deliver water to different shapes that sit on the grow media to deliver water to the plants.

This research project aims to see the impact of different shapes on the moisture level of each tray to ensure consistent watering. Rectangular shapes, an oval and an oval with a centerline were constructed. Further research will be done to monitor the temperature change around the plants before and after water, and use these data to calculate the moisture level of each tray and compare them. In addition, a CFD software simulation will be used to model water flow in the biowall.

Mentor(s):

Bill Hutzel (Polytechnic Institute); Dhanurja De Silva (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 748
Presentation Time: STEW 214A at 1:40pm-2:00pm

Influence of Waterjet Cut Quality for Fabrication of Test Specimen on Mechanical Testing Results

Author(s):

Jacob Montrose† (Polytechnic Institute)

Abstract:

Abrasive waterjet is an effective method of cutting fiber reinforced composites as it allows for precise cuts without introducing any thermal effects or direct contact with the cutting tool. In composite research, the fabrication of accurate and undamaged test specimens is crucial for testing their mechanical and physical properties. The cutting edge of the test specimen can be varied based on the speed of the waterjet cutting. The quality of the cut edges can have a significant impact on the test result since stress concentrations can be introduced differently under loading depending on the roughness of the edge. In this study, fiber reinforced composite tensile test specimens were fabricated using an abrasive waterjet with different cut qualities. The cut edge quality will be assessed using visual inspection, microscopic image, surface roughness tester, and scanning electron microscope. A tensile test was conducted with the test specimens cut with different cut qualities. Digital Image Correlation (DIC) technology will be used to track the local strain change during the test to investigate any stress concentration different at the edge when different cut quality was used. The tensile test data will be analyzed and presented to address importance of using proper abrasive waterjet cutting parameters for fabricating composite test specimen.

Mentor(s):

Garam Kim (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 749
Presentation Time: STEW 214B at 1:00pm-1:20pm

Machine Learning in Motion

Author(s):

Aiden Goen† (Engineering); Seojeong Park† (Science); Tri Than† (Engineering); Bhavya Patel† (Engineering); Arunima Chowdhury† (Science); Herbert Alexander De Bruyn† (Engineering)

Abstract:

The VIP (Vertically Integrated Projects) project Machine Learning in Motion consists of the development of motion analyzing software to help dance choreographers gather data on their rehearsals and performances, such as distance, speed, and position of the dancers. The project's goal is to provide open-source software for individuals to learn how technology may be utilized to assist artists from a variety of disciplines in using the physical world to impact the electrical and hardware realms. This data can be used in the dance-making process and/or performances through the interaction of design elements such as lighting, sound, and projection. The backend implementation tested for the motion tracking of multiple figures uses Pose Net and Move Net and TensorFlow. In the Front-End, the web app flow and UI has been conceptualized and is under development. The final web app flow and UI will be intuitive and user-friendly so that individuals unfamiliar with technology can easily navigate the application.

Mentor(s):

Renee Murray (Liberal Arts); Davin Huston (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 750
Presentation Time: STEW 214B at 1:20pm-1:40pm

Effects of mushroom types and amounts on postprandial plasma glucose, insulin, and triglyceride responses in middle-aged and older adults: a titration experiment

Author(s):

Jacqueline Schmok† (HHS)

Abstract:

Background: Limited human and animal research suggests chronically consuming mushrooms may favorably affect CVD and T2DM risk factors. The effects of consuming mushrooms on postprandial glycemic and lipidemic responses require more investigation.

Objectives: We assessed the acute effects of consuming different types and amounts of fresh mushrooms on postprandial changes in plasma glucose, insulin, and triglycerides.

Methods: For this randomized cross-over, repeated measures acute feeding study seven adults (37-69 y; mean 51±13) completed 5 test days in which they consumed a control salad with 0, 1, or 2 servings of white button (Agaricus bisporus) or grey oyster (Pleurotus ostreatus) mushrooms. After an overnight fast, blood samples were collected before and periodically for five hours after consuming a test meal. Plasma samples were analyzed for glucose, insulin, and triglyceride concentrations, and weighted mean values and integrated areas under the curve were calculated.

Results: Preliminary findings indicate no differential differences in glucose, insulin, or triglyceride responses.

Conclusion: While results from this study do not support differential effects of mushroom consumption on the outcomes of interest, this study was exploratory in nature and not adequately powered. Future research including a larger sample size is needed.

Funding Source:

Mushroom Council

Mentor(s):

Wayne Campbell (HHS); Cassi Uffelman (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 751
Presentation Time: STEW 214B at 1:40pm-2:00pm

Child Automated Speech-To-Text Project (CAST) : HMMs for Speech Recognition

Author(s):

Aakanksha Shripal† (Engineering); Aarini Panzade† (Science, Honors); Brian Ha† (Engineering)

Abstract:

Abstract Redacted.

Mentor(s):

David Purpura (HHS); Avery Closser (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 752
Presentation Time: STEW 214C at 1:00pm-1:20pm

Impact of Interest on Student Performance

Author(s):

Taylor Moore† (Agriculture)

Abstract:

Impact of Interest on Student Performance

T.L. Moore*, B. Wardwell, E. C. Ragland, and E.L. Karcher

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Interest is the state of wanting to know and learn more about a certain topic. It is an academic variable that may impact academic success in a class. The objective of this study is to describe how student interest in a topic impacts engagement and performance. This study includes 117 students enrolled in an Introduction to Animal Agriculture course during the Spring 2023 semester. Students in this course are divided among five laboratory sections. In each section, students were divided into three groups based on self-reported interest in a specific topic (high, medium, low). A pre-post content quiz was administered before and after observing a 30 min teacher-centered learning lecture on the topic. Two researchers observed the high and low interest groups' students' specific behaviors and measured engagement via the BERI method and utilizing a developed ethogram. Data collection is ongoing, but will be analyzed with a paired t-test to determine whether mean differences exist between pre-post test results for the high and low interest groups. Behavioral observations will also be compared between the groups. We anticipate that information from this study will lead to recommendations for incorporating interest into course grouping strategies.

Mentor(s):

Elizabeth Karcher (Agriculture); Elizabeth Ragland (Agriculture); Brianna Wardwell (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 753
Presentation Time: STEW 214C at 1:20pm-1:40pm

Undergraduate Researchers in the Purdue War Effort, 1942-1946

Author(s):

Mikayla Klemp† (Liberal Arts)

Abstract:

While students at Purdue West Lafayette may feel that campus is its own little world, its important to remember that undergraduates throughout Purdue's history have long been doing research work with nationwide - and indeed worldwide - impacts. Over the course of my archival investigations on the roles of undergraduate research at Purdue, I've discovered the monumental developments students made during Purdue's hand in the war effort of World War II. Their legacy of excellence broke boundaries for women in engineering fields, started the first Latin American Pilot Training Program, and developed technologies to assist in the wartime struggles of the home front. These findings will be presented in conjunction with Purdue University's Archives and Special Collections as well as the Office of Undergraduate Research with the intent to raise awareness about the role of international students and home-grown undergraduates in global research from 1942-1946. Several case studies of these research projects will be presented in poster format this Spring and may be developed into a Special Collections exhibit. The examples set by these students served as a stepping stone for many of the women and international students that pursue degrees in a variety of fields at Purdue today, and it is only right that their stories be told to inspire others to continue the legacy of undergraduate involvement at Purdue making the world a better place.

Mentor(s):

Adriana Harmeyer (Libraries); Amy Childress (Libraries)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 754
Presentation Time: STEW 214C at 1:40pm-2:00pm

Neural Recorder Amplifier

Author(s):

Azza Sumait† (Engineering); Marissa Davide† (Engineering)

Abstract:

Through the SoCET team, we're aiming to design a low-power, low-noise neural amplifier with a biotechnology focus. Direct neuronal measurements are necessary for medical devices. There are three design implementations, all with the same goal. The first design is in a 45nm PDK including a 12-channel differential MUX and a Low Noise Amplifier (LNA), which was designed by another research group at Purdue. We are creating a test bench that measures key parameters such as open loop gain, noise, CMRR, slew rate, and stability. These measurements will be used in comparing the performances of the other two designs. The second design is a translation of the first design in a 180nm PDK. As a result of using a different PDK, there will be different sizes of the components to get similar performance. The third design is modified to have a chopper instead of traditional capacitive feedback in addition to a newly designed LNA. This is done to reduce the imperfections of the original amplifier, reducing flicker noise and DC offset. Our system is designed with a voltage supply of 1.8V, power consumption of less than 1 uW, input referred noise of less than 3uVrms and nominal gain between 200-1000.The signal frequency of the chopper should be in the range of hundred Hz and several kHz and the input frequency must be much less than one-half of the chopping frequency. This project will help the ongoing research team to tape out a chip with the ability to measure low-noise neural signals.

Mentor(s):

John Peterson (Engineering); Saeed Mohammadi (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 755
Presentation Time: STEW 214D at 1:00pm-1:20pm

Implications of a novel Fic protein from Bordetella sp. on Whooping Cough

Author(s):

Rohan Aryan† (Science); Rahul Saproo† (Agriculture)

Abstract:

Fic (filamentation induced by cAMP) proteins are a diverse family of bacterial proteins that regulate various cellular processes by post-translationally modifying their target proteins using ATP as a nucleotide source. Recent epidemics of whooping cough-like illnesses worldwide have highlighted the need for the discovery of novel virulence factors critical for Bordetella species. In this study, we discovered a highly conserved Fic protein, BbFic, in Bordetella bronchiseptica that shows a 30-fold preference for GTP over ATP. We demonstrate that BbFic functions as a guanylyltransferase that carries out GMPylation, a post-translational modification, and offer structural insights into BbFic-GTP interaction. However, the target for BbFic-mediated GMPylation remains unknown. Our current experiments focus on the cloning and purification of the C-terminal helix-turn-helix (HTH) domain of BbFic, referred to as BbFic-Cterm. As BbFic-Cterm is small, we sub-cloned it into the pET-SUMO plasmid for better detection and solubility. Our goal is to use BbFic-Cterm to pulldown interacting binding proteins and determine its crystal structure to elucidate its mechanism of action. Identification of BbFic targets could aid in the development of more effective vaccines against Bordetella strains, especially in the face of emerging human-adapted B. bronchiseptica strains.

Mentor(s):

Seema Mattoo (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 756

Presentation Time: STEW 214D at 1:20pm-1:40pm

A Genomic Analysis of the Global House Dust Mite Allergen Diversity

Author(s):

Sarah Bennett† (Science, Honors)

Abstract:

Pyroglyphid house dust mites are a prevalent source of indoor allergens and are found globally, affecting about 30% of the world population. Although currently a number of allergens have been discovered in three house dust species, for which genomic data are available, the global diversity of allergen groups is unknown. Our study will sequence genomes of 48 species of house dust mites to deduce genes encoding thirty-eight allergen groups and analyze global allergen diversity. The DNA samples come from mite colonies collected globally in North America, South America, the Caribbean, Europe, Southeast Asia, Africa, Australia, and New Zealand. DNA will be extracted using the ultra-low input DNA methodology; 48 Illumina libraries will be generated to get 48 mite species at a coverage of 20x for each individual (1920 mite individuals total). To infer allergen-encoding genes, the sequence data will be mapped using two genomic reference sequences with gene boundaries confirmed by transcriptomic data. Two complementary mapping analyses will be done at the nucleotide and protein levels. Our annotated genomes will be deposited into GenBank. Our project will allow for better understanding of the allergy sensitization patterns and will improve allergy vaccine therapies, which will account for the actual diversity of house dust allergens.

Mentor(s):

Qixin He (Science); Pavel Klimov (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 757
Presentation Time: STEW 214D at 1:40pm-2:00pm

Role of receptor expression level in engineered T cell therapy efficacy

Author(s):

Tanvi Breinig† (Science, Honors); Kenneth Rodriguez-Lopez‡ (Science)

Abstract:

Cancer is a pervasive disease that affects people of all demographics; success in treating cancer has been largely ineffective and relapse often occurs even after initial remission. One relatively recent development in cancer treatment is T cell immunotherapy, in which patients are infused with engineered chimeric antigen receptor (CAR) T cells that target and destroy cancer cells with a high degree of specificity. Tremendous success has been achieved in blood-based tumor elimination but solid tumors are ineffectively treated. Of note, these populations of T cells have heterogeneous receptor expression levels. Our hypothesis is that lower CAR densities will result in productive cell signaling and activation, resulting in more frequent cytotoxic responses. Response durability may be confounded by cell age and exhaustion of the T cells over time. Using an interdisciplinary approach based on in vitro reconstitution and live cell assays, we measure the mechanistic thresholds for CAR T cell activation. We achieve a single cell understanding of activation over time and with regard to receptor density. We expect that these findings will inform the development of personalized cancer immunotherapy treatments.

Mentor(s):

Shalini Low-Nam (Science); Kevin Scrudders (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 758
Presentation Time: STEW 214A at 2:00pm-2:20pm

Elementary Students' Definitions of Failure: A Developmental Approach

Author(s):

Alicia Drewes† (Education); Jordan Fulk† (Education)

Abstract:

Failure can be described in various ways and perceived differently based on a number of personal factors. This study sought to better understand how elementary students define and react to failure and how these definitions might differ by grade level. Data for this study were a collection of interviews administered to students in first (n = 45) and fourth grade (n = 28). Students were asked what failure is and how it applies to their lives using semi-structured interview techniques. Interviews are currently being transcribed, and preliminary results are expected by the time of the conference. Findings from this study are important because the way that students understand and approach failures may influence their motivation and engagement in educational settings. Teachers may benefit from understanding developmental differences in students' beliefs about and approaches to failure as they move to introduce more productive failure experiences into earlier grades. Doing so without knowledge of students' initial perceptions might unintentionally depress their academic motivation.

Mentor(s):

Calah Ford (Education)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 759
Presentation Time: STEW 214A at 2:20pm-2:40pm

Fathers of Children with Autism: Perceptions of Provider Supports

Author(s):

Andrew Geguzys† (HHS); LeAnn Zhang‡ (HHS)

Abstract:

Studies have shown that parent training can have positive outcomes for both the individual with autism and their family (Dadabah & Parish, 2016). However, most parent trainings target mothers, but fathers have expressed the desire to be more involved with their children with autism (Meadan et al., 2015). The current study interviewed ten fathers of children with autism to assess their benefits, difficulties, and needs when working with service providers. Interviews were transcribed and line-by-line thematic analysis was conducted. Results indicate that fathers value communication from service providers and benefit from learning strategies offered by providers. Barriers include scheduling challenges and provider attitudes toward father involvement. Future desires of the fathers include information and additional opportunities for support. Implications of how the service providers meet the specific needs of fathers of children with autism will be discussed.

Mentor(s):

Rose Mason (Education); Eric Shannon (Education); Ban Sleiman Haidar (University of Illinois); Hedda Meadan-Kaplansky (University of Illinois)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 760
Presentation Time: STEW 214A at 2:40pm-3:00pm

Cultural border crossing in rural communities: A narrative exploration in teaching middle school science

Author(s):

Reagan Howard† (Science)

Abstract:

Rural students make up one third of the K-12 classrooms in the United States, yet face many obstacles such as limited resources, technology isolation, and lack of preparation for increasing diversity. Given these challenges, this study focuses on middle school science and engineering teaching in rural classrooms to understand how rural science teachers make STEM accessible to their students. We designed a single-case study with narrative approaches to understand how Mr. Jordan, a veteran middle school science teacher, supported rural students from low socioeconomic backgrounds to cross cultural borders between rurality and school science. For the entire academic year of 2021-2022, Mr. Jordan, participated in a professional learning community (PLC) that focused on creating student-focused equitable science and engineering classrooms. Grounding our work on cultural border crossing and sociotransformative constructivism, we conducted narrative interviews, collected reflective journals during the PLC, and two years of observational videos (pre-PLC and PLC). Using thematic analysis, findings from this study highlights beliefs and experiences of a rural teacher and strategies he utilizes to support students' learning and engagement with school science, particularly in response to increasing ethnic, linguistic, and socioeconomic diversity in rural communities of the Midwest. The overall implication of this study contributes to a nuanced understanding of hybridity as fusions of rurality and STEM culture in teaching science and engineering to students from rural communities.

Mentor(s):

Selcen Guzey (Education); Khanh Tran (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 761
Presentation Time: STEW 214B at 2:00pm-2:20pm

Children's Distress During COVID-19 and its Relation with Vocabulary Development at 18 Months

Author(s):

Kathleen Cory† (Science, Honors); Vivian Lee† (HHS, Honors)

Abstract:

The COVID-19 pandemic, which began in March 2020, led to many challenges for families, including daycare closures, stay-at-home orders, and stress associated with caregiving. This quantitative study asks how caregivers' experiences during the pandemic may have affected children's vocabulary learning. Participants comprised of native English-speaking parents and their 18-month-old children living in Indianapolis and West Lafayette, Indiana (n=82). Vocabulary percentile was quantified using the MacArthur-Bates Communicative Development Inventories (MBCDIs; Fenson et al., 2007), and COVID-19 impact was quantified using the COVID-19 Exposure and Family Impact Survey (CEFIS; The Center for Pediatric Traumatic Stress, 2020). Specifically, the CEFIS encompassed 4 measures: exposure, impact, parental distress, and child distress related to the pandemic. By splitting the subjects at the 25th MBCDI percentile, the data were categorized into higher and lower vocabulary groups. We carried out two separate analyses. The first focused on relations between each CEFIS measure and overall vocabulary percentile; the second asked whether the four CEFIS measures differed between higher and lower vocabulary groups. Child distress is the only CEFIS measure that significantly correlated with vocabulary percentile (tau= -0.161, p= 0.055) and that differed between high and low percentile groups (tau= -5.513, p< 0.0001). Parental distress (tau= 0.021, p= 0.804), exposure (tau= -0.058, p=0.484), and impact (tau=-0.038, p= 0.637) did not correlate or predict differences in vocabulary. Therefore, child distress related to COVID-19 appears to be related to vocabulary learning at 18 months.

Mentor(s):

Arielle Borovsky (HHS); Claney Outzen (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 762
Presentation Time: STEW 214B at 2:20pm-2:40pm

Deep Learning for Child Speech Recognition

Author(s):

Jasper Koliba† (Engineering); Reagan Becker† (Science); Aarohi Panzade† (Science, Honors)

Abstract:

Abstract Redacted.

Mentor(s):

David Purpura (HHS); Avery Closser (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 763
Presentation Time: STEW 214B at 2:40pm-3:00pm

Improving Overall Quality of Life for Uterine Fibroid Patients Living in Indiana

Author(s):

Sophie Shank† (HHS, Honors); Grace Khamis† (HHS); Isha Nair* (HHS, Honors); Cameron Kelly* (HHS)

Abstract:

Objective: Understanding healthcare experiences of uterine fibroids patients across the continuum of care, from early symptoms through diagnosis, treatment, and management from both provider and patient perspectives, while investigating the impact of social determinants of health on fibroids experiences.

Methods: We conducted 20 semi-structured interviews with fibroids patients and 14 with healthcare providers. Eligible patients were women aged ≥18 who had been diagnosed with fibroids and reside within 75 miles of Tippecanoe or Marion County, IN. Eligible providers had experience treating fibroids within Indiana. Audio-recorded interviews were transcribed verbatim and analyzed using thematic analysis techniques to identify emergent themes.

Results: Women experienced myriad physical symptoms, often manifesting into psychological and sexual disturbances that infiltrated all aspects of life. Internet searches were frequently mentioned as their primary information source, and fertility was a prominent factor in deciding treatment options. Health disparities prevented some patients from receiving quality care. Healthcare providers advocated for greater education of patients, as well as the need for more providers in the field.

Conclusion: Results offer rich insight into patient and provider experiences, highlighting areas of improvement. Practical recommendations to improve clinical care standards and patient health outcomes are noted. Implementation of this research can guide development of strategic, theory-based interventions aimed to target individual, relational, communal, and societal dimensions.

Implications: Using patient and provider observations to incorporate the social determinants of health into the social-ecological framework and to execute more effective care methods can enhance patient experiences and offer recommendations for improvements to fibroids care.

Mentor(s):

Andrea DeMaria (HHS); Monica Kasting (HHS); Alfu Laily (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 764
Presentation Time: STEW 214C at 2:00pm-2:20pm

Artificial Intelligence influences the artists

Author(s):

Rongbo Hu† (Engineering, Liberal Arts); Yutong Zhen‡ (Science)

Abstract:

Generative Artificial Intelligence (AI) like Stable Diffusion has made significant development and affected various industries, including the visual arts. This research aims to investigate the influence of AI on artists, including illustrators, 3D modelers, and designers. The ongoing research to comprehend how AI will continue to affect the world of art and the people involved in it. This research utilizes both quantitative and qualitative analyses. The researchers conducted interviews with several artists and reviewed news related to AI artists. From the artists' perspective, the attitudes were mixed. While some artists viewed AI as a groundbreaking technology that could aid them in working more efficiently, others expressed apprehension regarding the legal implications associated with AI. Furthermore, some artists were concerned that AI could eradicate human creativity and refuse people who aspire to enter the profession of art. Overall, in the interview, AI has not significantly influenced artists' remuneration, and none of them have incorporated AI into their workflow. Then, a survey with twenty thousand internet users revealed that the majority of people cannot distinguish between images generated by AI and those created by human artists. Moreover, this research analyzed data from thirty thousand comments on an e-commerce website selling graphics tablets. The study found that the number of individuals interested in pursuing a career in the visual arts field has not diminished, although the worry about AI's potential impact was discussed on the internet. In conclusion, the art community, including artists and consumers, is approaching AI with caution.

Mentor(s):

David Peterson (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 766
Presentation Time: STEW 214C at 2:40pm-3:00pm

Effect of Recycled Concrete Aggregate on the CO2 capture and bio-receptivity of cementitious composites: A new path to create net sub-zero carbon footprint materials

Author(s):

Yaw Yeboah† (Engineering)

Abstract:

Abstract Redacted.

Mentor(s):

Mirian Velay-Lizancos (Engineering); Husam Elgaali (Engineering); Marina Garcia Lopez-Arias (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 767

Presentation Time: STEW 214D at 2:00pm-2:20pm

Control My News Feed: Exploring How End Users Interact with and Manipulate Social Media Recommendation Systems

Author(s):

Harmya Bhatt† (Science)

Abstract:

Social media addiction is a growing concern in the 21st century with the advent of multiple platforms which promote instant messaging, short-form video entertainment, and media sharing. Conservatively, 30% of people in the United States admit to being addicted to social media (ThinkNow, 2019). While it is clear why people get addicted to social media, we have little knowledge about the coping mechanism people use to deal with their addiction. This project aims to research the coping mechanisms people use to deal with their addiction to short-form video social media platforms like TikTok, Instagram, YouTube Shorts, etc.

Our research methodologies involved web scraping more than 7 Reddit communities, online blogs, and Tumblr posts to gather textual data about the coping strategies people use to combat their addiction. We used a narrower qualitative approach to generate terminology about coping strategies. We conducted anonymous interviews with Purdue Students about their social media use. Using this data, we are able to learn how people cope with their social media addiction. With the knowledge of their coping mechanisms, we will be able to build tools and recommender systems to help people combat their addiction.

Mentor(s):

Tianyi Li (Polytechnic Institute)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 768

Presentation Time: STEW 214D at 2:20pm-2:40pm

Understanding the connection of KRAS activation and CIP2A expression in initiating PDAC events

Author(s):

Ella Rose Chianis† (Science)

Abstract:

Pancreatic ductal adenocarcinoma (PDAC) is the fourth leading cause of cancer-related deaths in the United States and has one of the worst five-year survival rates at only 11%. In over 90% of PDAC cases, there is an activating mutation in the GTPase KRAS. Due to a lack of critical binding sites, KRAS-targeted drugs have been elusive; therefore, alternative therapeutic targets are of interest. Protein phosphatase 2A (PP2A), a major serine-threonine phosphatase, negatively regulates many of the downstream factors of KRAS. PP2A is not often mutated in PDAC, and cancerous inhibitor of PP2A (CIP2A) is expressed at higher levels in PDAC. CIP2A inhibits PP2A by sequestering its regulatory subunit, preventing the subunit from associating with the complex. Together, this data suggests that PP2A activity is suppressed in PDAC, but reactivation remains possible. This increases our interest in PP2A reactivation as a potential therapeutic strategy. To understand both the mechanism through which KRAS upregulates CIP2A and CIP2A's role in oncogenesis via PP2A suppression, we have measured rate of protein production and degradation, protein localization changes, KRAS signaling with the loss of CIP2A, and changes in oncogenic phenotypes with the loss of CIP2A. Our results suggest a novel mechanism of KRAS activation increasing the rate of CIP2A translation. Additionally, the findings indicate that the loss of CIP2A is sufficient to prevent oncogenic signaling and phenotypes, suggesting an increase in tumor suppressor, such as PP2A, activity. This further implicates PP2A reactivation as a potential therapeutic strategy in PDAC.

Mentor(s):

Brittany Allen-Petersen (Science); Samantha Tinsley (Science); Gagan Mall (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 769
Presentation Time: STEW 214D at 2:40pm-3:00pm

The Implementation of a Universal, Single-Payer Healthcare System in the United States

Author(s):

Samuel Hammons† (Science)

Abstract:

In 2022, Galvani et al. found that a potential 338,594 lives could have been saved during the COVID-19 pandemic had the United States had a universal, single-payer healthcare system (Galvani et al. 3). This paper collates data from numerous previous studies to determine the overall potential benefits or detriments of the adoption of such a system by the United States. The paper finds that a universal, single-payer healthcare system would a) drastically improve average health outcomes in the United States, particularly for low-income populations, b) reduce significant amounts of waste within the administrative and billing healthcare sectors, c) eliminate uncompensated care, and d) substantially increase healthcare access. While the research indicated mild concerns over decreased innovation within the healthcare market, most of the findings of the cited studies reflected positively on the potential adoption of a universal system. As such, this paper recommends significant progress be made toward the implementation of a universal, single-payer healthcare system within the United States.

Galvani, Alison P. et al. “Universal healthcare as pandemic preparedness: The lives and costs that could have been saved during the COVID-19 pandemic.” Proceedings of the National Academy of Sciences of the United States of America, June 13, 2022. https://doi.org/10.1073/pnas.2200536119. Accessed February 20, 2023.

Mentor(s):

Fiona Wang (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 770
Presentation Time: STEW 214A at 3:00pm-3:20pm

Creating Robust Artificial Intelligence Models for Medical Imaging

Author(s):

Aditi Anand† (Engineering)

Abstract:

Artificial Intelligence (AI) is transforming the field of medicine. Following their success in computer vision, AI methods, and in particular deep learning, have shown great promise in various medical imaging tasks. However, AI models are highly susceptible to producing erroneous outputs in the presence of input noise and variations. This is perhaps the biggest challenge to the adoption of AI in medical settings where the consequences of mistakes can be critical. To address this challenge, we propose RoMIA, a framework for the creation of Robust Medical Imaging AI models. RoMIA adds three key steps to the model training and deployment flow: (i) Noise-added training, where a part of the training data is synthetically transformed to represent common noise sources, (ii) Fine-tuning with input mixing, in which the model is refined with inputs formed by mixing data from the original training set with a small number of images from a different source, and (iii) DCT-based denoising, which removes the high-frequency components of each image before applying the model to classify it. We used RoMIA to create robust AI models for chest radiograph classification using CheXpert, a widely used dataset with over 200,000 radiographs from Stanford Hospital. We evaluated the models on CheXphoto, a dataset intended to test medical AI robustness under a range of perturbations reflective of clinical settings. RoMIA models reduce misclassification by up to 38.5%, with an average improvement of 22.6%, suggesting that our work can be a step towards enabling the adoption of AI models in medical imaging.

Mentor(s):

Kaushik Roy (Engineering); Sarada Krithivasan (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 771
Presentation Time: STEW 214A at 3:20pm-3:40pm

Humidity: A Key Factor in the Properties of Recycled Textile Reinforced Mortars

Author(s):

Aniya Edwards† (Engineering)

Abstract:

Abstract Redacted.

Mentor(s):

Mirian Velay-Lizancos (Engineering); Marina Garcia Lopez-Arias (Engineering); Vito Francioso (Engineering); Husam Elgaali (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 772
Presentation Time: STEW 214A at 3:40pm-4:00pm

Review of gaps in reporting rigor of methods used for destabilization of the medial meniscus in mice

Author(s):

Tyler Williams† (Engineering, Honors)

Abstract:

Destabilization of the medial meniscus (DMM) in mice is a common research procedure for improving understanding of knee osteoarthritis pathophysiology and initial evaluation of novel therapeutics. Since its first description in 2007, over 500 peer-reviewed publications report DMM, but there exists methodological 'drift', and major gaps in reproducibility and reporting rigor. A comprehensive literature review was performed to better understand these problems. Numerous categories were tracked such as animal characteristics and management, anesthesia, surgical procedures, post-operative care, and pre- and post-mortem outcome measures. Most investigators used the C57BL6 mouse strain of the male sex and included such details in final manuscripts. Consideration of sex as a biological variable as required by federal funding agencies was generally not well considered. Animal management was underreported, but if reported, there was little variability between studies. The type of anesthesia was frequently not reported, but if reported was highly variable with isoflurane and pentobarbital being most common. The specific surgical details contained the most underreported categories, but apparent variability was quite low. Each lab reported that DMM was induced through the transection of the medial meniscus; however, the incision type, joint approach, suture pattern/type, and post-operative care was greatly underreported. Finally, the pre- and post-mortem outcome measures were frequently reported but were not consistent across groups. Overall, discrepancies in use of this model and in reporting will continue to create difficulties for interpretation of data between research groups. A standardized procedure and improved reporting could allow for increased rigor, repeatability and reproducibility of studies.

Mentor(s):

Dianne Little (Veterinary Medicine)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 773
Presentation Time: STEW 214B at 3:00pm-3:20pm

Time course changes of mTOR signaling pathway in differentiated SH-SY5Y cells

Author(s):

Priyanka Ranga† (Science, Honors)

Abstract:

mTOR signaling pathway dysregulation is associated with various neurodegenerative diseases as it is a major regulator of cell growth in response to nutrient-induced signals, like insulin. Activation of insulin receptors thus induces the upstream PI3K/Akt pathway of the mTOR signaling cascade. This study aimed to use the SH-SY5Y cell model to investigate the time course of upstream and downstream kinases of the mTOR signaling pathway, Akt and S6, respectively, in response to insulin deprivation and their return to baseline. In this study, SH-SY5Y cells were successfully differentiated using retinoic acid for five days, which was confirmed by observing more neuron-like morphology with longer neuronal projections and a pyramidal cell body. These cells were subjected to insulin deprivation for one hour and returned to normal conditioned media. Akt and S6 protein expression was probed at various time points to observe trends in the kinetics of the signaling pathway. The ability of the insulin-deprived cells to return to baseline confirms the responsiveness of SH-SY5Y to the fluctuation of insulin, making them an efficient representative in-vitro model for neurodegenerative disease. Our results showed that insulin deprivation resulted in a rapid and sustained decrease in phosphorylated Akt and S6. Interestingly, we observed that the return to baseline was much faster for Akt than S6. Akt phosphorylation could return close to baseline within 6 hours in insulin-supplemented media. This suggests that a longer period of time would be necessary for mTOR signaling to return to baseline compared to its upstream PI3K/Akt.

Mentor(s):

Aaron Bowman (HHS); Xueqi Tang (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 774
Presentation Time: STEW 214B at 3:20pm-3:40pm

Characterizing Strain Effects of Myocardial Infarction and Cardiac Patches Using 4-Dimensional Ultrasound

Author(s):

Samuel Zhang† (Engineering)

Abstract:

Cardiovascular disease is the leading cause of death around the world, one-third of which are due to myocardial infarction (MI) and the complex fibrotic remodeling process that follows. Following an MI, chronic fibrotic remodeling of the heart leads to decreased contractility, increased stiffness, wall thinning, dilation, and eventual heart failure. This study aims to reduce post-MI cardiac fibrosis through anti-proliferative pharmaceutical drugs eluted from implantable biopolymer cardiac patches. To evaluate the effect of these patches, we first induced MIs in a control group of mice (n=6) by ligating the left coronary artery. We implanted cardiac patches in another group of mice (n=5) without drug or MI for cytotoxicity testing of the biopolymer patch. We imaged mice using 4-dimensional high-frequency ultrasound over 28 days and analyzed images using a custom MATLAB code to evaluate left ventricular ejection fraction and myocardial strain. Preliminary MI-only results reveal akinetic muscle regions after infarction, along with signs of ventricular ballooning and myocardial thinning at ischemic sites, as shown by an over 50% decrease in cardiac strain magnitude between baseline and day 28. We expect a significant decrease in infarct size and preserved cardiac function with application of the drug-eluting patches. These early results indicate that MI causes a physiological remodeling response through cardiac fibrosis, which decreases cardiac strain. Finally, we can use our validated strain metrics toward our next steps to characterize the longitudinal therapeutic and mechanical effects of a drug-loaded cardiac patch in a mouse model of MI.

Mentor(s):

Craig Goergen (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 775
Presentation Time: STEW 214B at 3:40pm-4:00pm

The Role of Methylation in Regulating the Cellular Stress Response of Hsp31

Author(s):

James Rooney† (Pharmacy); Jacob Lindsey‡ (Pharmacy)

Abstract:

The purpose of this study was to understand the role of methylation in regulating the cellular stress response of Hsp31 in Saccharomyces cerevisiae yeast cells. Hsp31 is known to be methylated by the N-terminal methyl transferase Tae1. Changing the methylation site can affect the methylation status of Hsp31, which may play a role in the protective activity of Hsp31 against cellular stress.

Glo1 is a gene in yeast involved in catalyzing the detoxification of methylglyoxal (MGO), which is a byproduct of glycolysis. We established that Saccharomyces cerevisiae in the Glo1Δ background is sensitive to cellular stress by MGO. Mutant strains in the Glo1Δ background will simulate methylation levels, which can be used to determine if methylation increases or decreases the protective activity of Hsp31 under cellular stress. Hsp31 overexpression successfully rescues mutants in the Glo1Δ background when treated with MGO. In a high throughput screen using CRISPR-based technology from INSCRIPTA, a biotechnology company, we aim to replicate the results we observed in the Glo1Δ background and potentially uncover new phenotypes in a series of experiments that will investigate the role of methylation in cellular processes in addition to oxidative stress, including heat stress and protein synthesis. The INSCRIPTA library will allow us to collect data from approximately 1000 mutants simultaneously rather than completing the experiment for each mutant individually. These results will provide much greater insight as to how methylation globally affects the cellular processes involved in the protective activity of Hsp31 and other substrates in Saccharomyces cerevisiae.

Mentor(s):

Tony Hazbun (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 776
Presentation Time: STEW 214C at 3:00pm-3:20pm

Maiming Misinformation: Why Understanding Bias is Paramount to Democracy

Author(s):

Stephanie Perun† (Liberal Arts)

Abstract:

Information is said to be associated with meaning. But what happens if the information we assign meaning to is wrong? Without realizing it, many fall suit to the spread of mis/dis-information and can unknowingly spread false information. This can harm individuals or groups of people, especially in the political sphere. Research has shown that information manipulation is a global phenomenon and is used as a leading tool for some world Governments to purposefully put democracy at risk. It is also suggested that because the origins of most mis/dis-information are based only on suspicion, reviewing media on a deeper, more personal level, assists in shaping data driven political decisions. With a scoping review, this research takes a closer look at defining mis/dis-information as well as cognitive biases to assist in understanding the decision making process. This foundation is then applied in a broader political sense, reviewing how mis/dis-information has developed alongside the internet overtime (especially due to the interference of foreign states in western countries domestic policy processes) and in reviewing the “Information Warfare”. It is then that the two parts of this research, the reasoning behind decision making and an expanding awareness of manipulated political information, can be connected. The results of this research show that by understanding certain biases when viewing mis/dis-information, either intentionally or not, an individual is more likely to make better informed, data driven political decisions that in turn contribute to a stronger democratic society.

Mentor(s):

Bethany McGowan (Libraries)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 777
Presentation Time: STEW 214C at 3:20pm-3:40pm

American Foreign Policy and Public Opinion of the Crimean War (1853-1856)

Author(s):

Anurag Shah† (Liberal Arts, Science, Honors)

Abstract:

During the Crimean War (1853-1856), France and Britain took the side of the Ottoman Empire to curb Russian expansion. America, having friendly relations with Russia and a rivalry with the British, elected to stay neutral in the conflict but be diplomatically aligned to the Russian cause. This paper examines American foreign policy with the parties involved in the conflict. Strong Russo-American relations led to a mutual benefit for both parties as the conflict progressed, despite American neutrality. British-American relations, on the other hand, remained poor and culminated in a recruitment scandal, generating anti-British sentiment in the southern states. This paper additionally examines the views of Americans expressed through newspaper media, and through the individual writings of those Americans present in the theater of warfare. It identifies a north-south divide in the United States, with the northern states supporting the allied powers throughout the conflict, and the south states veering towards supporting Russia by 1855. This divide is connected to economics and foreign policy and aligns with the looming civil war soon after this conflict. It also explores the economic causes behind this divide and the general economic view of newspaper reporting. Finally, this paper explores American citizens' varied views on their own neutrality, through both newspapers and personal writings of those involved in the conflict.

Mentor(s):

Michael Smith (Liberal Arts); Jonathan Lande (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 778
Presentation Time: STEW 214C at 3:40pm-4:00pm

Women in the Early UN

Author(s):

Amelia Simpson† (Liberal Arts, Honors); Erika Wheeler‡ (Liberal Arts, Honors)

Abstract:

This research project has expanded the knowledge base on women's role in the early United Nations. Some of the gaps in this knowledge were present in the following subject areas: women's positions at the UN; women's role in important UN policy decisions (unrelated to women's rights, since women's role in women's rights issues has been more extensively researched); and the less obvious but lasting influences women have had on the United Nations. In order to research these above topics, I focused on looking through secondary sources, primarily in article form, to find what has been written about early UN women and what has not. The "has not," listed above, is the focus of this research. Along with secondary sources, I also used the primary source information provided to me by my colleague, Erika Wheeler, who compiled an extensive list of early UN women, their specific job titles within the early United Nations, some biographical information, and overall conclusions she has drawn from this research. Although the research for this project is not nearly complete, here are some of the conclusions we have drawn from our findings. 1: A typical female job-holder in the UN was recorded as having a wider variety of job titles than their male counterparts. 2: The motivations and beliefs of early UN women varied vastly, a fact that can often be overlooked when most of the information available on early UN women, although still important, is about their contributions to women's rights-related policies.

Mentor(s):

Jennifer Foray (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 779
Presentation Time: STEW 214D at 3:00pm-3:20pm

Comparing the Freezing Properties of Different Lunar Simulant Particles of the Ancient Moon

Author(s):

Mariana Aguilar† (Science); Valeria Garcia* (Science); Katherine Meves* (Science)

Abstract:

The Earth's moon we see today is vastly different from what it was 3 billion years ago when it was likely home to a collisional atmosphere. At this time, the Moon experienced volcanism, which released tremendous volumes of gas from the subsurface – enough to create a considerable atmosphere of up to 1 kPa, which is almost double the pressure on modern Mars. Previously, we described under what likely conditions cloud particles formed which is important for understanding the evolution of the lunar atmosphere, how it reacted to temperature gradients, and how it cycled volatiles. This was investigated through the water ice nucleation properties of two aerosols: JSC-1A lunar simulant, which has similar composition and properties to lunar sample #14163 returned by Apollo 14 Mission, and Exolith LMS-1D Lunar Mare simulant, which simulates the ancient volcanic deposits on the Moon. Our previous nucleation results showed considerable differences in freezing behavior between the JSC-1A and the LMS-1D, an unexpected result. Here we investigate these results by studying the nucleation properties of individual mineral species, present in both simulants, to understand what compositions favor the formation of water ice clouds as the next step toward understanding the evolution of the lunar atmosphere. We also extend our studies of simulants to include Exolith LHS-1D Lunar Highlands simulant, which mimics the ancient highland regions, for comparison with JSC-1A and LMS-1D.

Mentor(s):

Alexandria Johnson (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 780
Presentation Time: STEW 214D at 3:20pm-3:40pm

Determining the Strength of the Annular Modes in a Barotropic Atmosphere

Author(s):

Dean Calhoun† (Science)

Abstract:

The annular modes are well-known patterns of hemispheric-scale climate variability, which describe deviations in the atmosphere from the climate mean state. Eddy feedback processes describe how small perturbations to the mean atmospheric flow interact with each other to influence large-scale dynamical patterns. Various eddy feedback processes determine the strength of the annular modes, yet quantifying the influence of any particular process remains a challenge. A novel feedback analysis has recently been proposed as a framework to evaluate the relative importance of different climate system interactions. A Green's function-based approach enables me to approximate the collective response of the atmosphere to a change in the climate state and determine the most excitable dynamical mode (known as the neutral vector). To achieve this, I repeatedly run a model, applying a different weak localized forcing each time, and systematically analyze the output compared to unforced runs using matrix computations. As a proof of concept, I have successfully applied the methodology to a simpler model, the Lorenz 1996 model, to obtain a reasonable approximation, as a matrix solution, as well as the neutral vector. I will apply this framework to an idealized single-layer atmospheric model newly developed by the OpenQG team. Since this model contains only vertically-coherent (i.e. barotropic) eddy feedback, my work aims to provide an accurate assessment of the strength of one key atmospheric eddy feedback's contribution to the annular modes.

Mentor(s):

Lei Wang (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 781
Presentation Time: STEW 214D at 3:40pm-4:00pm

Tolerance and avoidance responses to novel saline conditions in an invasive treefrog

Author(s):

Addy Messerly† (Science)

Abstract:

Salinity is an environmental stressor for anurans, as their highly permeable skin makes them prone to osmotic stress when exposed to saline conditions. However, certain anuran species have colonized areas near saltwater habitats suggesting an ability to acclimate to saline conditions. Here, we evaluated tolerance and avoidance responses to saline conditions in the Cuban treefrog (Osteopilus septentrionalis), an invasive anuran distributed throughout Florida. To examine salinity tolerance, adult frogs were maintained in conditions reflecting a freshwater (0.5 ppt) or brackish (8.0 ppt) environment for six weeks. At two-week intervals, their salinity tolerance was assessed by quantifying individual weight change when submerged in brackish solution. We found that frogs maintained in brackish solution lost significantly more weight at weeks two and six, suggesting that salinity is an environmental stressor for Cuban treefrogs. Yet, exposure to salinity over time may change their physiological response to saline conditions as a smaller loss in weight was observed at week six than week two, and the weight change at week four was insignificant. Since salinity appears to be a stressor for this species, avoidance behavior was investigated by offering individuals the choice between freshwater or brackish environments. Our results show that Cuban treefrogs choose freshwater environments and may thus avoid saline ones. This study reveals that a non-native species can use behavioral strategies to respond to salinity, a condition with dehydrating effects, potentially allowing them to expand their newly established ranges into areas that other anurans may not be able to colonize.

Mentor(s):

Ximena Bernal (Science); Andrew Mularo (Science); Ana Longo (University of Florida)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 782
Presentation Time: STEW 214A at 4:00pm-4:20pm

Assessment of Vehicular Vision Obstruction Due to Driver's Side B-Pillar and Remediation with Blind Spot Eliminator

Author(s):

Dilara Baysal† (Engineering)

Abstract:

Blind spots created by the driver-side B-pillar impair the ability of the driver to assess their surroundings accurately, significantly contributing to the frequency and severity of vehicular accidents. Vehicle manufacturers are unable to readily eliminate the B-pillar due to regulatory guidelines intended to protect vehicular occupants in the event of side collisions and rollover incidents. Furthermore, assistance implements utilized to counteract the adverse effects of blind spots remain ineffective due to technological limitations and optical impediments. This paper introduces mechanisms to quantify the obstruction caused by the B-pillar when the head of the driver is facing forward and turning 90 degrees, typical of an over-the-shoulder blind spot check. It uses the metrics developed to demonstrate the relationship between B-pillar width and the obstruction angle. The paper then creates a methodology to determine the movement required of the driver to eliminate blind spots. Ultimately, this paper proposes a solution, the Blind Spot Eliminator, and demonstrates that it successfully decreases both the obstruction angle and, consequently, the required driver movement. A prototype of the Blind Spot Eliminator is also constructed and experimented with using a mannequin to model human vision in a typical passenger vehicle. The results of this experiment illustrated a substantial improvement in viewing ability, as predicted by earlier calculations. Therefore, this paper concludes that the proposed Blind Spot Eliminator has excellent potential to improve driver safety and reduce vehicular accidents.

Keywords: B-pillar, driver vision, active safety, blind spots, transportation, crash avoidance, side-view assist.

Mentor(s):

James Gibert (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 783
Presentation Time: STEW 214A at 4:20pm-4:40pm

Correlating the Relaxation Times of T1rho and T2 MRI sequences to Osteoarthritis Outerbridge Scores for Human Humeral Head and Glenoid Articular Cartilage Characterization

Author(s):

Andrew Ferrer† (Engineering)

Abstract:

Osteoarthritis affects over 25 million people in the US, and the glenohumeral (shoulder) joint is the third most affected joint behind the hip and knee. Primary glenohumeral osteoarthritis (PGHOA) is the progressive loss of articular cartilage in the shoulder that results in pain, decreased function, and subchondral bone eburnation. Current clinical methods for diagnosing osteoarthritis utilize magnetic resonance imaging (MRI) to assess cartilage, but this imaging modality is not validated for quantitative evaluation of cartilage structure damage in the shoulder. Quantitative MRI imaging and calculation of T1rho and T2 relaxation times correlate with proteoglycan and collagen concentration respectively in articular cartilage. In this study, we initially graded cartilage damage using Outerbridge scores (0=normal; 4=full thickness erosion of cartilage) to human humeral heads and glenoids from both shoulders in 21 cadaveric donors. The humeral heads and glenoids were then imaged with T1rho and T2 sequences using a Bruker 7T MRI system. Relaxation times were calculated at various anatomical sites using custom MATLAB code and correlated to the Outerbridge score of each individual sample. An observable non- significant trend (significance level of 0.05) in relaxation times between Outerbridge scores 0 to 4 was determined. There was a significant difference in relaxation times when comparing mild (Outerbridge scores 0-2) to severe (Outerbridge scores 3-4) glenohumeral osteoarthritis. Future studies will compare histological assessment of cartilage damage with T1rho and T2 relaxation times. With further evaluation and validation, the results from this study could enable quantitative diagnosis of PGHOA using T1rho and T2 relaxation times.

Mentor(s):

Dianne Little (Veterinary Medicine); Kentaro Umemori (Engineering); Deva Chan (Engineering); Gregory Tamer (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 784
Presentation Time: STEW 214A at 4:40pm-5:00pm

Manufacturing and Spatial Mapping of 2-Dimensional Array of Soft Capacitive Force Sensors with Carbon-Fiber Mesh and Silicone

Author(s):

Harry Lee† (Engineering, Honors)

Abstract:

As the popularity of smart and interactive technology continues to grow, the demand for more advanced force sensors is also increasing. However, current capacitive force sensors face challenges that include complex manufacturing, and temperature and humidity sensitivity. In this study, soft 2-dimensional arrays of capacitive force sensors were made by impregnating a single pre-woven carbon-fiber mesh with silicone, that acted as the dielectric layer. When compression force is applied, the distance between the upper and lower tows decreases, increasing the capacitance across that intersection. This paper demonstrates the manufacturing and investigates the range and spatial resolution of the woven carbon-fiber elastomer composite force sensor array. The resulting sensors were around 1.6 times the initial carbon-fiber mesh thickness of 0.24 mm, and therefore minimized the deflection of the sensor and distortion of adjacent force readings. Three different mesh configurations, which were single cell, loose mesh, and tight mesh, were tested and showed minimal change in sensor performance with tighter meshing. After calibration and spatial mapping, the sensors presented consistent results under repeated loading. The sensor also operated underwater and showed less sensitivity to high and low temperatures compared to typical capacitive forces sensors. This low-profile soft force sensor shows high spatial resolution capabilities and environmental resistance, showing great potential in applications such as robotics, wearable technology, and haptic interfaces.

Mentor(s):

Garam Kim (Polytechnic Institute); Eduardo Barocio (Purdue University)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 785
Presentation Time: STEW 214B at 4:00pm-4:20pm

Engineering challenges in re-implementations of the MaskFormer models in TensorFlow

Author(s):

Pongpatapee Peerapatanapokin† (Engineering); Ibrahim Saeed† (Science); Ananya Singh† (Science)

Abstract:

Introduction:

The Tensorflow Model Garden Team (TFMG) does research into re-implementations of various computer vision models with an emphasis on modularity, reusability, and reproducibility. We re-implement new computer vision models that were built in PyTorch into TensorFlow Model Garden, an open-source collection of machine learning models built in TensorFlow. Our team is currently building the MaskFormer and Mask2Former models, object segmentation models that have demonstrated excellent performance in both semantic segmentation and panoptic segmentation.

Objectives:

This discussion aims to outline and explain the engineering challenges we faced when re-implementing the MaskFormer and Mask2Former models in TensorFlow.

Methods:

Our first step is to familiarize ourselves with MaskFormer's research paper and PyTorch codebase. We look for 1) Discrepancies between the research paper and the codebase, 2) Existing reusable components in Google's TensorFlow Model Garden, and 3) Unavailable operations in TensorFlow that need to be built from scratch. Once we have implemented the components (data loader, architecture, loss functions, etc…), we perform differential testing with the model's PyTorch codebase, ensuring they output Tensors of matching shapes and values. Lastly, we train the model end-to-end in order to reproduce the accuracy results mentioned in the paper.

Results:

The major problems we have faced so far are 1) loading PyTorch's model weights to Tensorflow, 2) Unavailable operations (Sampling methods) from PyTorch, and 3)

Mentor(s):

James Davis (Engineering); Vishal Purohit (Engineering); Wenxin Jiang (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 786
Presentation Time: STEW 214B at 4:20pm-4:40pm

Transcranial Magnetic Stimulation Coil Optimization

Author(s):

Kevin Zhang† (Engineering, Honors)

Abstract:

Transcranial Magnetic Stimulation (TMS) uses coils placed on the scalp to induce electric (E)-fields in the brain, which in turn modulate brain activity. The inductive coupling between the brain and the head is relatively weak and the coils require large currents (1-5kA) to induce their effects. As such, TMS coils require large power supplies and coil winding cooling because the windings can heat up. The purpose of this project is to reduce power requirements and heat of TMS coils. We have developed a computational framework that given an existing coil design, it designs a coil that replicates the E-fields while minimizing the energy required. The framework requires a model of the existing coil and energy optimized coil support triangle mesh. The framework first finds the E-field induced by a standard coil using an in-house developed finite element method. Then, it optimizes a piece-wise linear surface current distribution that matches the E-field the closest while minimizing energy required. This optimized current distribution is then discretized into windings to determine the final design. We present several results indicating that our framework can significantly reduce the energy requirements of TMS coils.

Mentor(s):

Luis Gomez (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 787
Presentation Time: STEW 214D at 4:00pm-4:20pm

A Computational Analysis on Invasive Lionfish In Belize

Author(s):

Joshua Balan† (Science)

Abstract:

Since their discovery in the region in 2009, invasive Indonesian-native lionfish have been taking over the Belize Barrier Reef. As a result, populations of local species have dwindled as they are either eaten or outcompeted by the invaders. This has led to devastating losses ecologically and economically; massive industries in the local nations, such as fisheries and tourism, have suffered greatly. Attempting to combat this, local organizations, from nonprofits to eco-tourism companies, have been manually spear-hunting them on scuba dives to cull the population. One such company named Reef Conservation Institute(Hereafter referred to as 'ReefCI'), operating out of Tom Owens' Caye outside of Placencia, Belize, has dissected their caught lionfish for the past three years, and kept logs of results. With little to no studies reliably indexing the Belizean lionfish population, this dataset provides a priceless opportunity to take a first look and probe further questions for this population as a whole. This project accomplished this by computing various population statistics using these records, including the differences in sex ratio, presence of supraorbital tentacles, length, age, and more. The results and combinations of these factors provides new insight on current theories surrounding lionfish and their anatomy, but more importantly it opens new questions, the answers to which can shed light on new techniques to more efficiently cull the population for the future.

Mentor(s):

Greg Michalski (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 788
Presentation Time: STEW 214D at 4:20pm-4:40pm

A New Model of Auditory Aging in Chinchillas: Chronic Application of Furosemide to the Round Window

Author(s):

James Bundy† (Science, Honors)

Abstract:

In humans, hearing loss can come from many sources, from hair cell damage to degradation of other ear components. In auditory neuroscience, a hotly debated topic is which factor is primarily responsible for age-related hearing loss (ARHL). One of the proposed causes of ARHL is a drain of endocochlear potential, which is the battery that allows hair cells to transmit electrical signals. This battery can also be drained by intravenous furosemide, which results in temporary hearing loss. To measure the effects of the drained battery alone, in 2004, David Mills and Richard Schmiedt used an implanted pump in gerbils to apply furosemide to the middle ear over several weeks. Mills and Schmiedt found the chronic application of furosemide in young gerbils produced readings remarkably similar to aging. The present study will develop this approach in chinchillas: an osmotic pump will be implanted and furosemide will be delivered to the cochlea. Compared to gerbils, the auditory system in chinchillas is closer that of humans, and due to this, chinchillas are a more established hearing loss model. However, chinchillas' 15-year lifespan has limited their use in aging studies. Here, we propose a model of ARHL in chinchillas, which will allow for more powerful studies in the future to analyze the factors contributing to hearing loss and how they interact. This may allow for studies in chinchillas that analyze differences between hearing loss due to noise exposure and hearing loss due to aging, which can lead to more individualized treatments for hearing loss.

Mentor(s):

Mike Heinz (HHS); Robyn McCain (Veterinary Medicine)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk Presentation Abstract Number: 789
Presentation Time: STEW 214D at 4:40pm-5:00pm

Characterization of cell death induced by pharmacological activation of PP2A in Pancreatic ductal adenocarcinoma.

Author(s):

Indiraa Doraivel† (Science)

Abstract:

Pancreatic cancer is the fourth leading cause of cancer-related deaths in the United States. KRAS is mutated in 90% of pancreatic cancer patients. Oncogenic KRAS leads to aberrant cell proliferation and survival. But KRAS is considered hard to target, highlighting the importance of identifying alternative strategies to target this pathway. Pancreatic tumour microenvironment evolves with cancer cell progression leading to vascular remodelling and blood vessel collapse. This makes tumours nutrient deplete compared to surrounding normal tissues. To circumvent this, cells employ KRAS dependent macropinocytosis- an actin driven nutrient scavenging pathway. These macropinosomes then fuse with lysosomes and are degraded to recycle nutrients. Serine/Threonine kinases regulate the uptake and recycling kinetics of macropinosomes but the role of phosphatases is not well understood. Protein phosphatase 2A (PP2A) is a heterotrimeric Serine/Threonine phosphatase which inhibits downstream effectors of KRAS pathway. We observe that pharmacological activation of PP2A causes aberrant vesicle formation in cells that do not fuse with lysosomes. These vesicles build up in the cells eventually leading to cell death consistent with methuosis, a cell death pathway triggered by macropinosome accumulation. Since there are no methuosis markers we can confirm that the cell death is due to methuosis by ruling out other forms of cell death like apoptosis. When we inhibited apoptosis using Z-VAD, we found that the cell death by PP2A activator-DT061 is not prevented. These findings suggest that the cell death that occurs by activating PP2A could be methuosis, hence highlighting the novel role of PP2A in regulation of methuosis.

Mentor(s):

Brittany Allen-Petersen (Science); Garima Baral (Science); Claire Pfeffer (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

LITERATURE, LINGUISTICS, LANGUAGES, & CULTURE COLLOQUIUM

APRIL 13, 2023

STEWART CENTER 218

Research Talk - LLLC Presentation Abstract Number: 800
Presentation Time: 218A at 9:00am-9:20am

Ferzan Özpetek's Gays and Gaze: Redefining the Cinematic Queer Gaze

Author(s):

Zachary McCormick† (Liberal Arts, Honors)

Abstract:

The leitmotif of the gaze has been a question central to film studies for several decades. In 1975, film theorist Laura Mulvey proposed the male gaze as it pertains to the objectification of women, through which white cisgender heterosexual men project their fantasies onto women through means of voyeurism or fetishization. While critics have sought to propose the possibility of an alternative queer gaze, examination has largely been limited to the ways in which it directly confronts and rejects the heteropatriarchal framework that underlies the traditional male gaze theory. This paper, however, will instead examine how the queer gaze differs from Mulvey's male gaze in both the purpose that it serves and the consequences it has through an analysis and comparison of Turkish-Italian film director Ferzan Özpetek's "Il Bagno Turco" and "La Dea Fortuna." Particular attention will be devoted to the psychoanalytic and social underpinnings of this queer gaze and the concept of the queer gaze as one of foresight, balance, careful calculation, and reclamation.

Mentor(s):

Elena Coda (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster - LLLC Presentation Abstract Number: 801
Presentation Time: 218B at 9:20am-9:40am

Cultural Comparison: US vs France basketball marketing

Author(s):

Sophia Hoffmann† (Liberal Arts, Management, Honors)

Abstract:

This presentation will discuss the differences between the US and France basketball culture. In the US, basketball a major part of the nation's cultural identity. While the sport was first invented in Canada, when people think of basketball, they think of the US. Many children dream of playing in the NBA, even if the odds are slim. All over the world names like Michael Jordan, Kobe Bryant and Lebron James are known. The NBA teams pay their players millions, and they have their TV channel. The WNBA is still relatively young (1997) and still far behind the NBA. The WNBA is beginning to grow in popularity as women's and girls' basketball grows, but something is stopping the WNBA from taking off. In this presentation I will explore the differences in each league's marketing strategies, such as website designs, team names and colors. I will then compare the differences between the French leagues with the differences between the US leagues. By examining these differences across cultures, I will see their marketing schemes affect how engrained basketball is within their respective societies.

Mentor(s):

Jessica Sturm (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 802
Presentation Time: 218A at 9:20am-9:40am

Expanding Russian Vocabulary in a Cultural Context Through Chekhov Short Stories

Author(s):

Rowan Thornton† (Liberal Arts, Science)

Abstract:

Expanding learner's vocabulary and improving her reading skills are important goals in studying a language. In this research I will share my experience in reading short stories by Anton Chekhov. I will investigate vocabulary used in dialogs and monologs to better understand how Chekhov illustrates interactions between characters of different social, ethnic, cultural, and professional backgrounds. This will help me understand nuances of different words in context. I will consider a minimum of 5 different short stories by Chekhov which are slightly abridged and in Russian, catalog terms used by pairs of characters from opposing backgrounds in each story and create a glossary. Then I will explore the connotations and nuances of different word choices. Ultimately, I will not only expand my Russian vocabulary, but also deepen my understanding of intercultural communication in Russian society as portrayed by Chekhov. The glossary will be a useful tool for future language students.

Mentor(s):

Amina Gabrielov (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 803
Presentation Time: 218A at 9:40am-10:00am

Medieval Thoughts on Badgers and other Small Animals According to a 13th Century Bestiary

Author(s):

Taz Butler† (Liberal Arts)

Abstract:

Working alongside Prof. Mercier from the Classics department, I will transcribe and translate pages of a manuscript known as MS Bodley 764. This work is an illuminated medieval Latin bestiary or ‘book of beasts’ written in England in the late 13th century. This codex is currently housed at the Bodleian Library at Oxford University; thus I will be working from a facsimile. I have over three years of college Latin experience from Purdue and have done work with the Latin manuscript leaves that are held here in the Purdue Archives.

I will cover a few small animals that often get overshadowed by the more impressive animals (lions, eagles, dragons, whales, etc.). These larger animals tended to introduce their category, while the badgers, mice, and hedgehogs were tucked away in the back. There is plenty of literature about these great animals and the history behind them already, while the sources I could find about small animals were few, either talking about the symbolism of cats or the use of those cats to keep rats out of their walls. One of the few sources that did mention small animals only referenced a well where “the remains of 64 individual animals, including mice, voles, shrews, hedgehogs, and weasels” were found. There seems to be little written about the more inconspicuous critters in the bestiary which is why I chose to give them a closer look for my project.

Mentor(s):

Elizabeth Mercier (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 804
Presentation Time: 218A at 10:00am-10:20am

Mapping the complementary principle in Spanish-English bilinguals

Author(s):

Sage Morrison† (Liberal Arts)

Abstract:

In contrast to the public perception that bilinguals are “equally fluent” in each of their two languages (Wei, 2000), prior research has suggested that their languages are often used for different purposes and with different people. For example, bilinguals may be more likely to speak one language at home and one language in the workplace. This distribution of languages with respect to different domains is referred to as the “complementary principle” (Grosjean, 2008). Yet, few studies have attempted to systematically measure or map these domains (cf. Gasser, 2000). The purpose of this study was to understand the reasoning behind code-switching in the Spanish-English bilingual community within the United States.

A total of 454 bilinguals from a wide range of dominance profiles and geographic locations in the U.S. completed an online survey. In addition to completing surveys related to language dominance (Birdsong et al., 2012) and language switching experience (Olson, 2022), participants were asked to report topics for which they were most likely to use English, Spanish, or mix between languages.

Resulting topics were later sorted into two sections: formal and informal. Responders were then divided depending on their language dominance and language switching experience. Thematic Analysis showed that Spanish-English bilinguals prefer utilizing English primarily when speaking about formal topics, and Spanish about informal topics. When utilizing code switching in their speech, high and medium code-switching speakers (i.e, people who code-switch from a high to regular amount in their day-to-day speech) showed preference towards informal topics. Researchers should consider further study on the impacts of geographical location, gender, and education level on bilingual code switching within the U.S., and devote more attention towards low code-switchers (i.e, people who code-switch minimally in their day-to-day speech) to better understand their statistical insignificance.

Mentor(s):

Daniel J. Olson (Liberal Arts); Lori Czerwionka (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster - LLLC Presentation Abstract Number: 805
Presentation Time: 218B at 10:00am-10:20am

Changes in Russian Media Language in Turbulent Times

Author(s):

Evan Landau† (Engineering)

Abstract:

Since the recent resumption of conflict between Russia and Ukraine, Russian propaganda has used a variety of tactics to shape the domestic and international narrative around the war. By comparison of language used in Russian state, independent, and controlled-opposition media, the research team was able to identify patterns in word choice, style, and strategy between different types of media. Each news outlet has a distinct, consistent style in its news and word choice. Based on these patterns, it appears that the different news sources are used to provide contrasting views and an illusion of open discourse.

For this research, the team compared the language in news articles released by Russian and Russian-language media outlets on certain days. Research focused on the major state news outlets, party news outlets, and independent media, and data collected includes quotations from articles, annotations, and notes for qualitative comparison.

Mentor(s):

Olga Lyanda-Geller (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 806
Presentation Time: 218A at 10:20am-10:40am

Analyzing prosodic features in the encoding of politeness for Spanish offers

Author(s):

Emma Marks† (HHS, Liberal Arts)

Abstract:

Whereas seminal works in the fields of phonetics (Ohala, 1984) and pragmatics (Brown & Levinson, 1987) have suggested that higher pitch may be employed to encode politeness, recent investigations have suggested that, in some cases, formal speech correlates with lower pitch (Brown et al., 2014; Hübscher et al., 2017). However, these recent works failed in conducting a systematic analysis of the contextual variables of power, distance, and imposition proposed by Brown and Levinson (1987) to frame and analyze politeness.

The current study investigates whether these variables of power, distance, and imposition affect the mean pitch and speech rate in Spanish offers. The hypothesis for this experiment is that an increased pitch and a lower speech rate will occur in more face-threatening situations.

To answer these research questions, 35 Spanish native speakers completed a contextualized sentence-reading task where they read aloud 8 paragraph-length contextualizing situations, followed by an offer. The situations were balanced for two levels of power (high/low), distance (high/low), and imposition (high/low). Participants produced a total of 840 sentences. Analysis using Praat analyzed the mean pitch and duration of the target sentences. This was conducted by first separating out the individual sentences, proceeded by selecting apart each pronounced syllable and taking measurements on both.

Linear models will be conducted to observe the effect of the contextual variables on the use mean pitch and speech rate. The findings aim to contribute to the growing body of research in the interface between phonetics and pragmatics.

Mentor(s):

Daniel J. Olson (Liberal Arts); Bruno Staszkiewicz Garcia (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 807
Presentation Time: 218A at 10:20am-10:40am

Uncertainty, Identity and Conservative Narratives in Tár

Author(s):

Isidore White† (HHS)

Abstract:

Tár, directed by Todd Field, uses uncertainty in conjunction with identity to disingenuously convey conservative ideas about cancel culture. The film follows the life of Lydia Tár, a fictional and highly successful conductor for the Berlin Philharmonic, whose ultimate downfall is centered around accusations of sexual misconduct and racism. The protagonist’s identity as a lesbian woman educated in indigenous musicology is used throughout the film to provide an out for potential criticisms about the film’s conservative views on allegations of sexual misconduct and the diversification of classical repertoire. Despite significant lip service to these aspects of the character’s identity in the film’s opening scene, and in scenes where it is necessary to provide an out, they are considered superficially throughout the rest of the film, if at all. Secondly, the film uses uncertainty to minimize accusations of sexual misconduct, depicting them with distorted imagery, warped audio, non-linear sub-narratives, and a failure to include verbal descriptions of more than two sentences, despite the film’s two hour and thirty-eight minute run time. In contrast, Lydia’s brilliance as an artist is foremost, reinforced with powerful upshots, symmetrical imagery, and pseudo-biographical associations with real-life figures, such as Leonard Bernstein.

Mentor(s):

Emma Ben Hadj (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 808
Presentation Time: 218A at 10:40am-11:00am

Sports Culture and Brain Injury Protocol in France

Author(s):

Emma Niecikowski† (Liberal Arts, Science, Honors)

Abstract:

Soccer is a globally known sport and in France particularly, it is the most popular and has a large cultural impact as the system is regulated by the Ministry of Sports. Although the majority of skills require footwork, headers are an important factor in gameplay in which the player uses their head to hit the ball. Continuous traumas to the head caused by headers may lead to chronic traumatic encephalopathy (CTE). CTE is caused by repeated head injuries, and can affect many areas of the brain such as memory and judgment, and may lead to dementia.

The proper regulation of headers and doctor protocol during matches in France reflect reasons for CTE diagnoses in players. Countries like the United States and England have implemented regulations on headers, such as not allowing children to practice headers or limiting the amount one can practice each week. However, France has no regulation on heading and this is detrimental to the neurological health of the population as soccer is so popular. Overall, the culture and popularity of soccer in France may affect its lack of regulations by the governing body as allowing riskier play keeps the sport “pure,” but there must be a line drawn in which neurological health is considered over entertainment. In this project, I am going to analyze how French culture impacts brain injury protocol in soccer.

Mentor(s):

Jessica Sturm (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster - LLLC Presentation Abstract Number: 809
Presentation Time: 218B at 10:40am-11:00am

Culturally EnGRIND: An analysis of the socio-cultural impact of Grindr

Author(s):

Samuel J. Gray† (HHS, Liberal Arts, Honors)

Abstract:

The social networking application Grindr, a platform launched in 2009 intended for queer male users, is widely considered to be at the forefront of cultural corrosion in the gay community. Empirical work by researchers Tien Ee Dominic Yeo and Tsz Hin Fung (2018)1 offers support for the concern that Grindr exerts a detrimental influence over the gay community due to the tempo the platform imposes on social interactions. However, the concept of an entirely queer platform for users to forge connections in a safe virtual setting is enormously beneficial to this social group. Theorist Sharif Mowlabocus (2010)2 explores the dichotomy of the potential for digital gay communication platforms, acknowledging the promise of increasing connectivity within a minority group, while simultaneously warning of the subcultural proliferation of cybercarnality. This article examines the damage and animosity the structure of Grindr inflicts on the gay community by making sexual objectification a pervasive part of the gay experience, the encouragement of anonymity in intimate interactions, and the increasingly transactional view of others. I propose that it is through the design and structure of the application that we observe the mechanisms that encourage objectification and perceived invisibility of self, subsequently promoting these increasingly transactional interactions amongst users. While Grindr is designed to foster communication between members of the gay community, in reality, the nature of these interactions serves to sever feelings of connectivity within this subcultural group. Exploring these shortcomings may elucidate avenues to better forge positive communication methods within this minority community.

Mentor(s):

Paige Frazier (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster - LLLC Presentation Abstract Number: 810
Presentation Time: 218B at 11:00am-11:20am

Motion Vectors in Akan

Author(s):

Shamiso Marondera† (Liberal Arts); Brynne Mills† (Education, Liberal Arts); Yekaterina Yegorova* (Liberal Arts, Science, Honors)

Abstract:

This study analyzes how motion vectors are linguistically encoded in Akan, a Kwa language from Ghana, to provide a better understanding of cross-linguistic expression of motion. A set of 175 animated video-clips designed to elicit and contrast path, telicity, result, and agentivity were used to collect data (Benedicto, 2019); for this study, series 01 (30 promtps) was analyzed. Four native speakers were recorded responding to these prompts. Their responses were transcribed and coded for the linguistic expression, or lack thereof, of the three planes of space involved in motion (vertical, horizontal and deictic/sagittal). Instances of motion vectors were marked and analyzed with regard to the nature of the prompt (i.e, how many axes were encoded), specific words and morphemes, telicity, and other linguistic features. Prompts are able to elicit the deictic (come, go), vertical (up, down), and horizontal (cross, pass) planes. Our initial findings indicate a lack of vertical direction expressed in responses. Out of the prompts that allow speakers to express a deictic and/or horizontal path, the speakers expressed these planes 100% of the time. On the other hand, the vertical plane was never expressed, even when a prompt encoded such a construction. The results of this study provide insight into the structure of Akan, how native speakers perceive and describe motion in day-to-day activities, and how Akan differs from other languages in its expression of motion.

Benedicto, Elena. 2019. Motion Predicates: Moving Along. A Tool for the Analysis of the Sub-Eventive Structure inMotion Predicates. PURR, Purdue University. https://doi.org/10.4231/R7PN93M4

Mentor(s):

Elena Benedicto (Liberal Arts); Eunice Opoku (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 811
Presentation Time: 218A at 11:20am-11:40am

Bilingual Language Experience and Acceptability Judgements

Author(s):

Gage Mardlin† (Liberal Arts)

Abstract:

Code-switching is defined as the alternation between two languages within a given interaction. Previous research has shown that code-switching is not random, and operates within a series of social and grammatical rules. Bilingual speakers have strong intuitions about what constitutes an acceptable or grammatical switch. For example, the sentence in example 1a is considered grammatical, while 1b is ungrammatical. Yet, while a large body of research exists assessing the acceptability of different types of switches, this research has failed to consider the possible role of prior experience with code-switching. That is, while some bilinguals engage in significant amounts of switching, other bilinguals never switch. This study examines whether experience plays a role in how speakers judge code-switches as acceptable or not.

A total of 90 Spanish-English bilinguals completed three different experiments, largely replicating Balam et al. (2020), Parafito Couto et al. (2019), and Stadthagen-González et al (2018). These studies examined three different types of switches, using a Two-Alternative Force Choice task, in which bilinguals were asked to pick between two possible switches and determine which "sounded" better to them (19,440 total responses). Unlike previous studies, participants were also asked to complete the Bilingual Code-Switching Profile (Olson, 2022) as a measure of their code-switching experience. Stimuli was randomized to avoid bias and the languages were color coded to distinguish separation.(Olson, 2016)

Results (Figure 1) showed an effect of experience on code-switching acceptability judgments. Namely, bilinguals with more experience code-switching showed stronger discrimination between canonically "good" and "bad" switches.

Example 1

a. The cars chocaron en la esquina.

'The cars crashed at the corner.'

b. *I le told him.

'I told it to him.'

Mentor(s):

Daniel J. Olson (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster - LLLC Presentation Abstract Number: 812
Presentation Time: 218B at 11:20am-11:40am

Karate in France

Author(s):

Alexander Wills† (Liberal Arts, Polytechnic Institute)

Abstract:

This project presentation will focus on describing the sport of karate and its practice, consumption, and overall growth as a sport to play and be a member of a club in France, in addition to numerous fun facts included throughout the presentation. It will also discuss its history and how it came to be a recognized sport in France as well as how it became a part of the French sports culture and how it has had cultural influence, through such events as its eventual inclusion in the Olympic Games and other major tournaments. The presentation will utilize a primarily graphics-focused PowerPoint presentation with images and video content relating to the discussion of the sport of karate in France and the Francophone world and it will additionally employ a digital poster, running continuously throughout the duration of the presenter’s presentation time, which displays the information and research concerning this subject.. There will also be additional game-like elements fused into the presentation through the art style in the running PowerPoint to enhance the presentation and help combine the presenter’s dual majors in an interesting and unique way. The research done and final presentation will conclude and emphasize the importance of karate as a sport in France and highlight the presenter’s passion for the sport.

Mentor(s):

Jessica Sturm (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 813
Presentation Time: 218A at 12:20pm-12:40pm

Language, Ableism, and Identity

Author(s):

August Trepanier† (Liberal Arts)

Abstract:

While code-switching, bilingualism, and Spanglish have been studied extensively in linguistics, cultural studies, psychology, and many other fields, few critical works have looked at the ways in which notions of “acceptable” language usage intersects with ideas about ability, disability, and intelligence. Using Borderlands/La Frontera by Gloria Anzaldúa as a theoretical lens, as well as support from disability justice scholars, and others, I will explore the ways in which normative attempts to police the boundaries of acceptable language usage exhibits and incorporates the logics of ableism. The work of Anzaldua especially will help me to frame the ways in which Spanish and Spanglish usage in the United States is often framed in the terms of deficiency, and defect, lenses also often associated with disabled people. I will explore the ways these logics become weaponized to police compliance not only in language, but also selectively valorize normative American experience, worldview, and culture. According to the testimony of the selected authors, these rhetorics also become embedded in personal feelings of self-worth and belonging, as these authors are constantly navigating multi-faceted, “border” identity.

Understanding the place of ableism in nativist, xenophobic, and exclusionary rhetoric is important in the United States, as Latinx and racialized people continue to experience the outcomes of ableism through inflated unemployment rates and disproportionate representation in segregated special education classrooms. It is also important to understand the place of disability in systems of power for collective liberation now and in the future.

Mentor(s):

Cara Kinnally (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster - LLLC Presentation Abstract Number: 814
Presentation Time: 218B at 12:20pm-12:40pm

Second language speakers' use of no sé 'I don't know': Patterns of use and pragmatic functions

Author(s):

Eryk Chazares† (Agriculture, Engineering)

Abstract:

While there is a large body of research that examines language acquisition, learners' use of discourse markers to organize interaction and communicate one's stance have received relatively little attention (c.f. Dings 2014, Lafford 1995, Shively 2015). These aspects of discourse are important as they lead to greater interactional competence (Young, 2011, 2013). Traditionally, no sé 'I don't know' has been understood as a negative epistemic marker that indicates an absence of knowledge related to a discourse topic. More recently, a variety of discourse-level functions have been associated with this structure in various languages, such as to mitigate or hedge (Schegloff 1996), avoid a response (Stivers & Robinson 2006), or structure turn-taking (Pekarek Doehler 2016). While no sé is often acquired early on by second language learners, it remains to be seen whether learners use this structure in ways similar to native speakers.

Addressing this gap, the current investigation examines the functional uses of no sé 'I don't know' by English speaking learners of Spanish. This quantitative and qualitative study draws on data from interviews conducted with 36 English-speaking learners of Spanish, 10 native speakers of Spanish, and 10 native speakers of English. To examine the patterns of use of no sé 'I don't know' and its pragmatic functions, the analysis considers collocation patterns of no sé and I don't know across groups and a pragmatic analysis of the most common patterns.

Mentor(s):

Lori Czerwionka (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 815
Presentation Time: 218A at 12:40pm-1:00pm

Intercultural Competence within the BTS Fanbase

Author(s):

Ashelyn McKillip† (Agriculture); Gracie Pearson† (Liberal Arts)

Abstract:

Increasing globalization and expanding connectivity between cultures through different backgrounds, social media, and travel has led to an increased interest in the intercultural competency of individuals. The present study investigated the effects of being a fan of K-pop boy band Bangtan Sonyeondan (BTS) on intercultural competency, with the assumption that intercultural competency would have a linear relationship with the length of time an individual has been a fan. 58 Purdue undergraduate students participated in the online survey. In order to measure fan's intercultural competency, three instruments were used; Multicultural Personality questionnaire-short form (MPQ-SF; Van derZee, Van Oudenhoven, Ponterotto, & Fietzer, 2013), Intercultural Sensitivity short form, Chen & Starosta, 2000), and Intolerance of Uncertainty scale-short form (IUS-SF; Carleton, Norton, & Asmundson, 2007). Results of this study indicated no statistical significance in Multicultural Personality, but some significance in aspects of Intercultural Sensitivity and Intolerance of Uncertainty. Though there was some variation in mean values for all personality traits depending on how long individuals were active fans. Based on our findings, we can conclude that the present study's results advance the application of intercultural competency in a K-pop fan context.

Mentor(s):

Huai-Rhin Kim (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Poster - LLLC Presentation Abstract Number: 816
Presentation Time: 218B at 12:40pm-1:00pm

Fiction Editorial Internship

Author(s):

Nathaniel DeChambeau† (HHS)

Abstract:

Sycamore Review (est. 1988, first issue 1989) is a literary journal run by the Purdue Creative Writing Program, primarily by its MFA graduate students: https://www.cla.purdue.edu/academic/english/publications/sycamore-review/index.html. I am one of the three Wilke interns tasked with specific contributions. In order to sort through hundreds of submissions per semester, the journal employs two interns to read through them: one for fiction and one for poetry. These readers analyze the pieces, looking at both overall quality and how well it fits the journal's artistic style. Exceptional stories are passed on to the Leadership Team and Creative Writing MFAs who contribute to Sycamore Review, including the Prose Editor Suraj Alva, the Managing Editor Weiji Wang, and the Editor-In-Chief Logan February. The editors and preliminary readers choose which stories and poems are accepted for publication based on a variety of criteria, including style, prose, themes, meaning, and quality. The team then works with the third Wilke intern to make sure that Sycamore Review's aesthetic and agenda are represented consistently on its website. Over the course of this internship as a fiction reader, I have learned about the early processes of paring down submissions, and I expect to learn more about the formatting and publishing process as the internship continues.

Mentor(s):

Angelica Duran (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 817
Presentation Time: 218A at 1:00pm-1:20pm

Rites of Passage in medieval German literature

Author(s):

Elizabeth Spendlove† (HHS, Liberal Arts)

Abstract:

My case studies will be Der arme Heinrich, Tristan und Isolde, and Parzival.

These three texts in particular examine the trials and tribulations a main character must overcome in order to pass a given test, by either a superior or an unknown force, such as the universe. A common theme is followed in each story, where initially there is a downfall of some sort, a roadblock or a set back, the protagonist must first have a sense of defeat before being able to claim victory. In Der arme Heinrich this is seen, as Heinrich, in search of his cure, becomes a recluse when he doesn't find any possibility for a remedy to his illness. Though as he passes his given test - saving the woman who was willing to sacrifice herself to save his life - he is given the cure by an otherworldly power. When examining Tristan und Isolde the test to pass presents itself in the shape of their love being judged, as they are viewed as being asleep with a sword in between them for protection. The downfall of their love at the end of the story suggests their test was not passed, thus leading to ruin. Parzival passes his test after failing many trials, due to taking metaphoric advice given to him literally and transgresses down a path of doom in his life. It isn't until he learns the correct way and realizes where in his life he has made errors, that he can backtrack and persevere

Mentor(s):

Beate Allert (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 818
Presentation Time: 218A at 1:20pm-1:40pm

I AM A SPECIALIST IN BLACK MAGIC: A COMPARISSON OF FOUR RUSSIAN FAUSTS

Author(s):

Juan Nicolas Galindo Mantilla† (Liberal Arts)

Abstract:

The literary myth of Doctor Faustus and the jokester demon Mephistopheles has been vital in the development of Russian literature. This research aims to examine the development of the myth throughout the 19th and early 20th century in Russia. I analyse the Faust myth in Aleksandr Pushkin (A scene from Faust), Ivan Turgenev (Faust), Valery Briusov (The Fiery Angel) and Mikhail Bulgakov (The Master and Margarita). I first examine the influence of Goethe’s Tragedy on the Russian works and then analyze them in relation to each other, arriving thus to a timeline of the development of the story in Russia that takes into account the main themes and forms taken from elsewhere and reshaped. The idea of the superfluous man, fundamental to Russian literature in the XIXth century, is explored in length, because these authors use it to construct their faustian figures. Also, the comedic aspects of each textual construction are contrasted from version to version in order to uncover the authors’ implementation of social satire.

Mentor(s):

Jeffrey Turco (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 819
Presentation Time: 218A at 1:40pm-2:00pm

Is Sor Juana's Mother the Speaker in Her Famous Sonnet?

Author(s):

Odalis Campos Vasquez† (Liberal Arts, Honors)

Abstract:

Sor (Sister) Juana Inés de la Cruz, the most important Mexican author of the colonial period, wrote sublime and challenging baroque poetry. Many of these poems examine the intricacies of affective relationships. This project analyzes sonnet 168, a poem rich in antithesis and chiasmus, which follows the cultural labyrinth faced by men and women during Sor Juana's lifetime. A strong racial hierarchy imposed by Spain encouraged individuals to form relationships with partners who were of equal or superior standing. A cultural reading of sonnet 168 suggests points of relevance with the personal situation of the poet herself. Considering this personal and cultural background, it is justifiable to imagine the voice of the poem as that of Sor Juana's own mother.

Mentor(s):

Paul Dixon (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 820
Presentation Time: 218A at 2:00pm-2:20pm

What a Little Verb Contributes to Telicity: The Case of Verbal Series in Akan

Author(s):

Katya Yegorova† (Liberal Arts, Science, Honors); Brynne Mills* (Education, Liberal Arts); Miso Marondera* (Liberal Arts)

Abstract:

Our study provides a syntactic analysis for the expression of telic predicates in Akan (Kwa, Ghana). The data was recorded from four Akan speakers responding to 175 video-prompts designed to elicit telicity (Benedicto, 2019). Preliminary results show that telic readings are obtained in Akan motion events via the presence of a resultative morpheme si ‘stand’ (1). This morpheme selects a locative constituent introduced by an endpoint-denoting element so ‘top’. The absence of the morpheme si ‘stand’ indicates atelicity; a potential locative can be introduced by a post-position nkyɛn/ho ‘side’ (3).

1. Anomaa no a-tu a-firi fence no so a-kɔ-si dua no so

Bird DEF PRF-fly 3SG-leave fence DEF top PRF-go-stand tree DEF top

‘The bird flew from the fence and landed on a tree there.’

We claim that si is the head of the result sub-eventive structure (V-RES) in the motion structure as shown in the square-bracket tree in (2), and that -si moves head-to-head to the path denoting V-deictic head kɔ ‘go’.

2. Anomaa no (a-)tu (a-)firi fence no so [v-DEI <(a-)kɔ-si_j> [V-RES t_j [XP-Loc dua no so]]]

The absence of the V-RES substructure in (3) yields an atelic interpretation:

3. Anomaa no a-tu a-firi fence no so re-kɔ dua no ho

Bird DEF PRF-fly PRF-leave fence DEF top PROG-go tree DEF side

‘The bird on the fence is flying towards a tree’.

4. Anomaa no (a-)tu (a-)firi fence no so [v-DEI <kɔ> [XP-Loc dua no ho]]

This contributes to our understanding of the complexities of motion predicates cross-linguistically.

Benedicto, Elena. 2019. Motion Predicates: Moving Along. A Tool for the Analysis of the Sub-Eventive Structure in Motion Predicates. PURR, Purdue University.

https://doi.org/10.4231/R7PN93M4

Mentor(s):

Elena Benedicto (Liberal Arts); Eunice Opoku (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 821
Presentation Time: 218A at 2:20pm-2:40pm

Depictions of German-Jewish Resistance in World War II Films and Documentaries

Author(s):

William White† (Science, Honors)

Abstract:

This research paper looks to compare and contrast the depiction of German-Jewish resistance during World War II in documentaries and films such as The Ritchie Boys and Inglourious Basterds. Many movies made during or about World War II focus on Jewish people as victims of the Holocaust saved by the Allied troops instead of depicting the empowered Jewish soldier who helped fight back. The Ritchie Boys is a non-fiction documentary about a group of German-born Jews who joined the U.S. military and went back to Europe as soldiers. They were influential throughout the war because their knowledge of the language and culture made them great at gathering intelligence. Inglourious Basterds centers around the story of a fictional group of Jewish soldiers who set out to take out as many Nazis as possible in Tarantino’s style of violent revenge. While these movies differ in style and tone, they both reveal the impact of resistance and the complexities of the human experiences during the war. Ultimately, this paper argues that both works are important in the larger narrative of resistance during World War II and reveal the complexities and nuances of war and resistance.

Mentor(s):

Beate Allert (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 822
Presentation Time: 218A at 2:40pm-3:00pm

Kafka's Intentional Vagueness, and the Challenge of Translation

Author(s):

Steven Bass† (Liberal Arts, Science)

Abstract:

German literature in the early 20th century was shaped by the rapidly industrializing society of the time. Responses to the broad societal change generally focused on one of two perspectives: Expressionist writers explored their new world through the lens of emotion and subjective experience, while those espousing New Objectivity and other opposing movements channeled the realism popular in the late 19th century to criticize newly-formed power structures. One author stands out for his unique integration of these competing viewpoints: Franz Kafka. The term Kafkaesque refers to his unique literary style, which blends the outlandish and absurd from Expressionism with a dreary, bureaucratic view of reality. This style creates an ironic tension between the delirium of plot and the banality of setting in his works.

Kafka’s creative works also pose a unique challenge for an international audience, that being the problem of attempting to translate a work of prose whose language is left intentionally vague, drawing on homonyms and connotations that only exist in the original language in which the text was written. Bearing this challenge in mind, this presentation aims to explore the motivations behind and effects of Kafka’s unique writing style, and to draw on this background – alongside a new creative work written originally in German then translated to English – to discover how to address the unique challenges of creative translation.

Mentor(s):

Jen William (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 823
Presentation Time: 218A at 3:00pm-3:20pm

Grammatical Gender Barriers to Gender-Conscious Translation of German Literature

Author(s):

Eleanor Dyas† (Engineering, Honors)

Abstract:

Translation without influence does not exist. The mere act of rewriting introduces the translator's perspective and slight changes can alter the meaning, intent, and reader experience of a phrase. These effects are complicated further by grammatical gender when translating German's masculine, feminine, and neuter noun classes to English, which while retaining gendered pronouns, primarily uses epicene nouns. Gender-conscious translation is particularly critical when translating literature discussing inequitable archetypal gender roles, where the morphological nuances and accompanying assumptions of the work's original language are themselves an allegorical literary device. The following analysis of a poem written by the author titled Fußpuren [Footsteps] and its translation from German to English functions as a case study of these potential pitfalls and highlights the value of socially and linguistically informed translation in preserving a work's intended meaning.

Mentor(s):

Jen William (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 824
Presentation Time: 218A at 3:20pm-3:40pm

English-Russian Philosophical Glossary: Losev, Florensky, and Bakhtin

Author(s):

Michael Linge† (HHS, Liberal Arts)

Abstract:

Different fields of academia hold reputations for their use of language and terminology to fit their respective needs. My research project this semester focuses on the philosophical lexicon of three prominent Russian philosophers of the 20th century. The specific works analyzed are Losev’s Dialectic of Myth, Florensky’s Imaginaries in Geometry, and Bakhtin’s essays on text and philosophy of act. In the selected works, Losev, Florensky, and Bakhtin focus on philosophy of myth, philosophy of mathematics, and philosophy of literature, respectively. It is my goal to analyze, compare, and contrast how each philosopher employs their philosophical lexicon. This English-Russian glossary will facilitate readers into the world of both Russian philosophy and the systems of Losev, Florensky, and Bakhtin. How are philosophical terms and concepts dealt with by each writer within their fields and systems? This is the question I aim to answer in my project. To accomplish this, I read works of each philosopher in English and Russian side-by-side, documenting the key ideas and terms and how they articulate the writer’s point.

Mentor(s):

Olga Lyanda-Geller (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Research Talk - LLLC Presentation Abstract Number: 825
Presentation Time: 218A at 3:40pm-4:00pm

Animacy effects and the production of passive or active relative clauses in Mandarin

Author(s):

Yongjia Deng† (Liberal Arts)

Abstract:

Various linguistic pressures affect sentence planning and production, including the semantic similarity of the entities. One example is animacy, or whether the entities are human or nonhuman: “the woman that kissed the girl” is more difficult to produce due to “woman” and “girl” both being animate; as these are both potential agents and patients, this causes interference. So, individuals might use the passive relative clause to deemphasize the agent, such as “a girl that was kissed by a woman”, or even deletion in “a girl that was kissed”. Gennari (2012) found that speakers produced more passive relative clauses when both the agent and patient are animate. A study of Mandarin relative clauses showed similar results (Hsiao & MacDonald, 2016). Both studies suggest that using the passive form instead of the active allows the speakers to differentiate between the patient and the agent. These two studies only include animate subjects with animate objects and inanimate objects. Our present study uses similar picture-based elicitation and expands the condition to include inanimate subjects with animate and inanimate objects in Mandarin relative clauses. We hypothesize that, like Hsiao and MacDonald (2016), there would be more passive relative clauses produced when individuals describe entities with the same semantic features, e.g. when both agent and patient are inanimate. A second condition involves eliciting the same relative clauses within a complex ba SOV structure. We hypothesize that passives will be avoided when embedded inside a more complex ba SOV structure, as this requires more cognitive load.

Mentor(s):

Elaine Francis (Liberal Arts); Vanessa Sheu (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

VIRTUAL PRESENTATIONS

APRIL 10-14, 2023

CONFERENCE WEBSITE

Virtual Presentation Abstract Number: 900

Presentation Time: April 10-14 on Conference Website

Design and Evaluation of a novel binder protein for SARS-CoV-2 using the game Foldit

Author(s):

SeArre Abebe† (Science, Honors)

Abstract:

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus causing COVID-19, infects human cells when the receptor binding domain (RBD) of the viral spike protein binds to the human angiotensin converting enzyme 2 (ACE2). Antibodies targeting the spike protein have been shown to block RBD-ACE2 interaction effectively and have been used for the treatment of COVID-19; however, antibodies cannot be delivered intranasally to treat early stages of infection due to their large molecular size and instability. Therefore, there is a need for small proteins that can bind with high affinity to the spike and prevent its interaction with ACE2. Protein design using current automated methods is difficult due to the exponential number of possible structures that would need to be searched and the imperfect prediction of a protein's native conformation. The online citizen science game Foldit provides a potential solution to these challenges by combining human spatial reasoning skills with the Rosetta algorithm into an effective platform for protein design. Here, we present a novel SARS-CoV-2 binder protein that was designed using Foldit. Computational methods were used to measure and evaluate the binding affinity of the proposed structure and the spike protein receptor binding domain. The proposed protein consists of 93 residues and uses a three-helix bundle. Hydrophobic packing and hydrogen bonding were incorporated at the RBD-binder protein interface to optimize target binding. The computer-generated protein provides a candidate for SARS-CoV-2 therapeutics. Laboratory testing will need to determine the folding, stability, and neutralizing capability of the proposed binder protein.

Mentor(s):

Zahra Tehrani (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 901
Presentation Time: April 10-14 on Conference Website

Synthesis and Characterization of Chalcogenide Perovskite-related Materials

Author(s):

Izoduwa Aimiuwu† (Engineering, Honors)

Abstract:

Currently, the renewable energy research focus has surged towards developing methods for increasing the efficiency of photovoltaic technologies. Perovskites, which refers to the crystal structure of the material, are an emerging photovoltaic technology that have shown to be highly efficient. The current high-performing perovskites, lead-halide perovskites, come with certain toxicity issues. Additionally, these perovskites are extremely air-sensitive which makes scale-up of this technology a grand challenge. To combat these concerns, a new perovskite, barium zirconium sulfide ($BaZrS_3$), is believed to have similar optoelectronic properties of the current halide perovskite technology while also being more stable. The work in this presentation will cover methods to synthesize these and related materials under less extreme conditions than what has traditionally been used. Different experiments were performed which focused on synthesizing both zirconium and barium sulfides and other experiments on $BaZrS_3$ to remove unwanted impurities. The primary method of synthesis was a colloidal procedure performed either on a Schlenk line or in a solvothermal microwave reactor, where a variety of material precursors, temperatures, and reaction times were used to find optimal conditions. Characterization was done to determine the experimental products via x-ray diffraction (XRD), Raman spectroscopy, and x-ray fluorescence (XRF). This project is ongoing, as the synthesis of the sulfides such as BaS_2, ZrS_2, and other ternary phases come with difficulty; however, key observations and conclusions drawn based on the results give us insight on where to progress next.

Mentor(s):

Daniel Hayes (Engineering); Rakesh Agrawal (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 902
Presentation Time: April 10-14 on Conference Website

Developmental Atrazine Exposure Modifies Expression of Synucleins

Author(s):

Isabelle Akoro† (HHS)

Abstract:

Atrazine is a herbicide used throughout the Midwest US to prevent broadleaf weeds in crops. The US EPA has set the maximum contaminant level at 3 ppb (µg/L) in drinking water. Atrazine (ATZ) is an endocrine disruptor that interferes with normal physiology and homeostasis throughout development and the life course. Zebrafish models have been used to study neurodegenerative diseases due to the same major brain structures and blood brain barrier as humans including Parkinson's disease (PD). Alpha synuclein (aSyn) is a key pathogenetic target in PD and zebrafish have three synucleins (sncga, sncgb, sncb), of which sncgb is most similar to human aSyn. The zebrafish was used to test the hypothesis that an embryonic atrazine exposure alters expression of synuclein genes, leading to PD-like pathology. AB adult zebrafish were bred and their embryos were collected in groups of 50 in petri dishes. Embryos were exposed to 0, 0.3, 3, or 30 parts per billion (ppb, µg/L) atrazine from 1 hour post fertilization (hpf) to the end of embryogenesis (72 hpf). Larvae were collected from each dish, RNA isolated, and cDNA synthesized for qPCR analysis. qPCR compared the transcript level of each target gene among the atrazine treatment groups. Statistical analysis was then conducted to determine significant changes using $\alpha=0.05$. A decrease at 0.3 ppb and 30 ppb was detected for sncga and sncgb. These findings support our hypothesis that an embryonic atrazine exposure alters expression of the synuclein genes. Additional studies are needed to determine the impact of these gene changes on PD pathogenic phenotypes.

Mentor(s):

Jennifer Freeman (HHS); Sydney Stradtman (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 903
Presentation Time: April 10-14 on Conference Website

Sycamore Review Poetry Review

Author(s):

Nasser Alsinan† (Engineering)

Abstract:

Sycamore Review (est. 1988, first issue 1989) is a literary journal run by the Purdue Creative Writing Program, primarily by its MFA graduate students: https://www.cla.purdue.edu/academic/english/publications/sycamore-review/index.html. I am one of the three Wilke interns tasked with specific contributions. The journal has built a strong reputation in the literary community and receives hundreds of poetry submissions per semester from across the globe. In order to accept poems for publication, I work with the Sycamore Review editors to read through the poems and then label the ones that I believe suit the journal's aesthetic with a "Yes" based on tone, diction, form, and theme. The Editor-in-Chief, Logan February; the Managing Editor, Weiji Wang; and the Poetry Editors, Kanika Ahuja and JK Anowe, then review the poems promoted by the readers and choose the ones that they believe should be accepted. Sycamore Review publishes 12 poems per issue, and it also accepts creative prose fiction and nonfiction, typically publishing 5 pieces of fiction and 4 pieces of nonfiction. Accepted poems get to be published in Sycamore Review for an issue for the winter/spring and for the summer/fall. Wilke Interns in fiction, poetry, and web design work and communicate with the editorial team to create thematic and aesthetic through-lines that result in a cohesive vision for each issue. Through working as a Wilke Undergraduate Editorial Assistant-Poetry, along with the Wilke Undergraduate Editorial Assistant-Fiction and Wilke Undergraduate Editorial Assistant-Digital, I have learned how to review and choose poems for publication within a literary journal, as well as all the practical labor that goes into any publication.

Mentor(s):

Angelica Duran (Liberal Arts); Casey Gray (Liberal Arts); Logan Akinwale (Liberal Arts); Weiji Wang (Liberal Arts); Anthony Okafor (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 904
Presentation Time: April 10-14 on Conference Website

Algorithm Tools to Infer Users

Author(s):

Kihunn Anderson† (Polytechnic Institute)

Abstract:

nanoHUB has hosted thousands of resources for all different age groups and implements computational tools for researchers and others. nanoHUB is an open platform that focuses on delivering high quality content, reaching a greater audience; nanoHUB gives access to material online for computational research and collaboration. With tens of thousands of users, our goal has been to differentiate and compare groups based on nanoHUB's user activity into clusters. A set of algorithms were implemented to compute our user data, clustering those with similar activity patterns. The main goal is to combine a collective of algorithms and compare results to previous analysis, hoping to achieve more information from our users.

Mentor(s):

Gerhard Klimeck (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 905
Presentation Time: April 10-14 on Conference Website

Applying FCNNs to Natural Disaster Imaging

Author(s):

Kyle Bautista† (Engineering); William Jiang† (Science, Honors)

Abstract:

Applying FCNNs to Natural Disaster Imaging

Kyle Bautista and William Jiang

kbautist@purdue.edu | jiang868@purdue.edu

Abstract

Today's demand for increasingly complex computer vision algorithms provides ample reason to explore the modern semantic segmentation framework based on fully convolutional neural networks. Jonathon Long et. al. at the University of California Berkeley proposes and implements solutions to optimize semantic segmentation. The paper, "Fully Convolutional Networks for Semantic Segmentation", concludes that the convolutional networks, trained end-to-end, pixels-by-pixels, exceed the (then) state of the art in semantic segmentation. The research used these documented solutions as a reference benchmark and port the necessary processes to an environment where further solutions can be more readily explored. The models were benchmarked on updated PASCAL VOC image data sets. As such, an initial benchmark with the existing solution was created and compared with following iterations. A Google Colaboratory environment was chosen as this allows for a familiar interface for fellow undergraduate researchers that is both accessible and free. Post-model recreation, the team explored further optimizations of the models for our team's needs: natural disaster images. Our results were measured in IU (region intersection over union).

Mentor(s):

Yung-Hsiang Lu (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 906

Presentation Time: April 10-14 on Conference Website

WiFi PCB Shield for SoCET's 6th Generation Microchip

Author(s):

Alexander Beal† (Engineering); Niels Van Ritbergen† (Engineering)

Abstract:

System on Chip Extension Technologies (SoCET) is a professor-led team of undergraduate and graduate students who design, test, and fabricate a system on chip (SoC). The process from start to finish gives students experience in the techniques and tools used in the wider industry. In particular, SoCET’s PCB sub-team works on creating printed circuit boards which allow for the user to interface with SoCET’s in-house SoC. This semester, the PCB team has been tasked with creating shields for SoCET’s 6th generation microchip, AFTx06. The PCB team has designed various types of shields thus far, including WiFi, Ethernet, LCD, and camera. The WiFi shield was designed around the ESP 82 microcontroller to provide AFTx06 with WiFi access. For this task, it was necessary to research and select components using individual datasheets. To design a schematic for the shield, the open source EDA platform, KiCad, was used. Following several iterations of the schematic, the layout process began. Laying out a PCB involves organizing individual components based on functions with connections called traces so the board works as expected when manufactured. As we continue our work this semester, we will get experience with the schematic design along with layout and routing of previous generations of boards, specifically AFTx04 and AFTx05.

Mentor(s):

Mark Johnson (Engineering); Rauf Erkiletlioglu (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 907
Presentation Time: April 10-14 on Conference Website

The Intersection of Horror and Romance: How Dracula Became A Romantic Icon

Author(s):

Caitlin Blanchard† (HHS, Honors)

Abstract:

Hollywood has been obsessed with vampires since the silver screen, with a particular focus on Dracula. The purpose of this study has been to understand how and why Dracula's cinematic portrayals have changed over time, evolving from a monster to a romantic figure. The study examines 3 main movies (Nosferatu, 1922; Dracula, 1931; Bram Stoker's Dracula, 1992) with a few others for brief support throughout the 20th-21st centuries in order to examine the evolution of on-screen Draculas. The study also examines American culture during this period and how the changing times have been reflected in the writing and portrayals in the movies examined. The patterns of change within movies and specifically within the writing for Dracula is reflective of second wave feminism. With women's perspectives becoming highlighted, the female gaze steadily began to influence how cinema was and is approached. The Dracula from 1992 displays these methods, giving him and Mina Harker, the love interest, a particular depth and nuance that previous Draculas lacked. This is important to note as it suggests that the importance of the female perspective may be what influences romantic notions within a character. The depth provided by the female gaze allows for many characters to be multifaceted rather than previous "good vs evil" roles. This complexity then allows us to see these monster characters as more human and perhaps capable of loving and being loved.

Mentor(s):

Megha Anwer (Honors)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 908
Presentation Time: April 10-14 on Conference Website

Basal cortisol levels are not associated with confrontational language in parent-adolescent conflicts at any stage of puberty.

Author(s):

Gina Canino Quinones† (Science)

Abstract:

Both parent-adolescent conflict and the adrenal hormone cortisol increase during adolescence and have been associated with externalizing problems (e.g., aggression; Koss et al., 2017). Further, increasing parent-child conflict over two weeks is related to an increase in total cortisol output (Kuhlman et al., 2016). We hypothesize that higher cortisol could make adolescents more prone to confrontation with their parents during a conversation. Further, pubertal development may impact cortisol-related risk for externalizing problems (Ge & Natsuaki, 2009), including confrontational language. This study examines whether pubertal timing moderates the association between basal cortisol levels and adolescents' confrontational language during a parent-adolescent conflict.

Data are from 220 majority White (70%) adolescents aged 11-17 years (M=13.65, SD=1.53). Pubertal status was determined via Tanner stage (Marshall & Tanner, 1970). Parent-adolescent dyads completed a conflict task where confrontational language (i.e., frequency of strong emotion words, accusatory statements, and sarcastic/frustration words) were quantified in 30-second increments and summed. Salivary cortisol was collected prior to the conflict. Confrontational language was skewed and subsequently dichotomized (i.e.,0=None, 1=ANY). Logistic regression showed no effects x2(N=198) =1.15, p=0.76 for cortisol (OR=0.00, 95%CI [0.00, 0.00], p=0.56), pubertal status (OR=0.31, 95%CI [0.00, 102.46], p=0.69), or their interaction (OR=2.08, 95%CI [0.00, 71.85], p=0.69). Thus, cortisol levels prior to conflict are not associated with confrontational language during parent-adolescent conflict and puberty does not moderate the association.

Mentor(s):

Kristine Marceau (HHS); Amy Loviska (HHS)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 909
Presentation Time: April 10-14 on Conference Website

Nanohub Analytics Clustering Algorithm

Author(s):

Aneesh Chakravarthula† (Science, Honors)

Abstract:

This project deals with user data in Nanohub analytics, which is a website that has interactive simulations for scientific purposes. The goal is to make the website more user-friendly, and that is done by collecting data about the users and analyzing it to better understand the users. The task is to create a new clustering algorithm that better categorizes the users and their usages in order to fully understand different qualities of the users. The clusters would describe a group of users that have a certain attribute common to all and are similar in respect to some variable. In this case, the clusters describe classroom use, in which they are used to identify different classrooms in different universities. The algorithm should be good enough to group together users based on the different ranges of the variables, and it should be good enough to be distinguishable from other users which it is not even closely related to. In this case, these clusters are used in order to identify users that study in universities from researchers that do not belong to universities, since they have a different usage of Nanohub from classroom students. Overall, there are multiple algorithms in order to categorize users based on how closely related they are; however, the task is to create an even better algorithm.

Mentor(s):

Gerhard Klimeck (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 910

Presentation Time: April 10-14 on Conference Website

Temperature Dependence of Infrared Reflectance of Hyperbolic Materials

Author(s):

Ziyang Chen† (Engineering, Honors)

Abstract:

Hyperbolic materials have garnered heightened research interest with their anisotropic properties, properties that exhibit different values in different directions. This variation has led to many optical and thermal properties in hyperbolic materials that are unachievable with any other materials. One prominent example of such materials is molybdenum trioxide, for which prior research had discovered the infrared reflectance and dielectric function (a critical function for semiconductor applications). This research project investigated the infrared reflectance and dielectric function of molybdenum trioxide at multiple temperature points spanning from -110 °C to 227 °C. molybdenum trioxide flakes were sampled and processed to a thickness of 1 to 5 micrometers, placed in a temperature control stage modulating sample temperature. An FTIR (Fourier-Transform Infrared Spectrometer) emitted and collected infrared radiation with wavelengths ranging from 2.5 to 15 microns, polarized in the longitudinal and transverse directions of the flake. With a preceding reflectance benchmark obtained with gold, the infrared reflectance of molybdenum trioxide was computed as a percentage and plotted as a spectrum against wavenumber. This spectrum was then loaded in MATLAB, and a Lorentz-Drude model approximation was applied to derive the dielectric functions at all temperature points. This research compared the infrared reflectance of molybdenum trioxide across a wide temperature range to search for changes and tendencies in properties with temperature variations and provided screening for future research in the anisotropy and temperature-dependence in hyperbolic materials.

Mentor(s):

Xianfan Xu (Engineering); Yikang Chen (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 911
Presentation Time: April 10-14 on Conference Website

SoC Design Flow – From Front-End to Back-End

Author(s):

Wilbur Chen† (Engineering); Tam Le† (Engineering)

Abstract:

The System on Chip Extensions Technology (SoCET) team has now developed an updated version of AFTx06, which is AFTx07. While the digital design works on what to update on AFTx07, our job as a design flow team is to take the Register Transfer Level (RTL) from digital design team and put it in a full physical layout – one with wires, metal, and other material.

This process involves three main steps: Synthesis, Floor Planning, and Place and Route. Synthesis translates the created Register Transfer Level (RTL) code to a gate-level netlist. The second step is floor planning, which comprises of placing macros, power rails, and deciding the size of the die and core of the chip. The final step that we need to implement is placing and routing, which physically places and wires the mapped netlist, preparing the chip for the physical design process. Physical verification steps such as Layout versus Schematic (LVS) and Design Rule Check (DRC) are also performed throughout and at the end of the process.

We also make some improvements to the physical design process on AFTx07. Particularly, we are figuring out how to load and effectively place macros in the floorplanning stage as AFTx07 requires on-chip SRAMs. Furthermore, we try to improve the clock frequency in order to make the chip run faster. These improvements aim to assist in the optimization in the physical design process of AFTx07 compared to that of AFTx06.

Mentor(s):

Mark Johnson (Engineering); Conor Green (Engineering); Ryan Montsma (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 912
Presentation Time: April 10-14 on Conference Website

Supply Chain and Manufacturing Operational Excellence for Business Models

Author(s):

Sitong Chen† (Management); Chelsea Lu† (Engineering); Jiayi Zou† (Management)

Abstract:

Dow Chemical, a producer and supplier of raw materials for a variety of agricultural, electronic, energy, and manufacturing businesses seeks to optimize the supply chain services of their chemical products to industrial customers. The purpose of our research is to propose a three-step prescriptive model relating forecast demand, raw material input ratio, and multi-plant production ratio to optimize manufacturing efficiency. Our research considers variables detailed in Dow's weekly sales dataset, specifically material group, plant, shipping week, and shipping quantity. Given weekly sales data by material group for the past year, our study first compares the forecasting performance of multiple models including time series, Monte Carlo simulation, and the Newsvendor model. The output of this step provides an estimate of raw materials required to meet quarterly demand for the various material groups. Then, the aggregate quarterly demand forecast of all raw materials serves as the input to our optimization model which aims to minimize total excess production using linear programming subjects to plant capacity and fixed input ratio constraints. Finally, the study arrives at the optimal production plan that maximizes the total profit of the two manufacturing plants of interest. The three-step prescriptive model will help the company smooth production schedule, reduce inventory costs, and improve its overall supply chain efficiency. Furthermore, it is a model that can be scaled to optimize more complicated production processes by adjusting the number of constraints and inputs without altering the underlying structure of the model.

Mentor(s):

Zhan Pang (Management)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 913
Presentation Time: April 10-14 on Conference Website

Improving Worker Safety by Understanding Risk Compensation as a Latent Precursor of at Risk Decisions

Author(s):

Deniz Cinarli† (Engineering); Javier Reiche* (Engineering); Soe Thurain* (Engineering)

Abstract:

Due to the increases in frequency and severity of heat waves within hot working areas, construction workers are at a high risk of experiencing accidents and heat stroke. Despite the wide range of research on the high likelihood of experiencing heat stroke among construction workers, there is a paucity of research regarding the effects of heat stress on workers' fatigue, performance, and reduced situational awareness. To address this gap, this study monitored roofers' real-time physiological responses and task performance under normal and heat-stress conditions within an extended reality environment. The findings showed the negative effects of extreme heat on participants' situational awareness and task performance, which can increase the likelihood of involvement in risk-taking behaviors. This study can enhance safety professionals' awareness of the adverse effects of heat stress and lead to designing evidence-based interventions to effectively reduce the associated negative impacts.

Mentor(s):

Sogand Hasanzadeh (Engineering); Shiva Pooladvand (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 914
Presentation Time: April 10-14 on Conference Website

Caregiver Information-Seeking Behavior Influences ASD Diagnosis Timing in African-American Children: A Scoping Review

Author(s):

Khalya Dent† (HHS, Liberal Arts, Honors)

Abstract:

Autism spectrum disorders are a group of neurodevelopmental conditions that are caused by differences in the brain. People with these disorders often struggle with social communication and interaction and have methods of learning that differ from the social norm. When looking at autism spectrum disorders (ASD), such as autism and attention-deficit hyperactivity disorder (ADHD), researchers have mainly focused on Caucasian males. What we know about these disorders hasn't looked holistically at how they manifest in people of color or women. This scoping review aims to assess the size and scope of available research literature related to how the health information-seeking behaviors of parents influence the timing of diagnosis in African American children.

Current research findings suggest that because African American parents often are unaware of what ASD may entail in totality or don't know that ASD manifests differently within African American children, they miss the signs that would make early diagnosis possible. They are less likely to seek ASD-related health information online or in libraries. And they are less likely to seek information from healthcare professionals. Distrust in the healthcare system further aggravates the issue, as does stigma related to ASD-related diagnoses. Healthcare providers and administrators should ensure that all patients have proper access to information concerning how ASD manifests differently across races and genders. Efforts to regain trust and reduce ADS-related stigma should also be established. Libraries and librarians can lead or support these efforts. Educating parents and caregivers could lead to earlier diagnosis of children with ADS. Children can receive proper treatment and accommodations when diagnosed early, producing better social and academic outcomes.

Mentor(s):

Bethany McGowan (Libraries)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 915
Presentation Time: April 10-14 on Conference Website

siRNA delivery capability and cellular uptake mechanism of Dopamine nanoparticle, Nanosac

Author(s):

Aksana Doss† (Engineering)

Abstract:

Small interfering RNA, siRNA, is a short double-stranded RNA with about 20-25 base pairs, which down-regulates specific gene expression by inducing mRNA degradation. It has been actively used as a therapeutic agent for cancer, and autoimmune diseases. Systematic delivery of siRNA to solid tumors requires the nanoparticle to avoid premature degradation and enter the cell to release siRNA for gene silencing. Recently developed ‘Nanosac’, a noncationic soft polyphenol nanocapsule, is designed to encapsulate the siRNA into dopamine to protect the siRNA to a target delivery. The softness of Nanosac improves extravasation and penetrating the tumor compared to its hard counterpart. In addition, softness helps to reduce macrophage uptake without affecting the interactions with tumor cells.

The cellular uptake mechanism of the Nanosac is not clear. The shell of the nanoparticle, dopamine, degrades in acidic conditions releasing siRNA. It is suggested by previous research, the nanosac recruits serum albumin, co-opts caveolae-mediated endocytosis to enter tumor cells, and efficiently silences target genes. The cell uptake data was analyzed by adding Cy3-labeled siRNA to Nanosac. The cell treated by Nanosac was visualized by confocal microscopy. The results showed that lysotracker did not co-line with Nanosac, proving that Nanosac did not uptake via lysosomal uptake pathway but the caveolae-mediated endocytosis cell uptake mechanism.

Mentor(s):

Yoon Yeo (Pharmacy); Woojun Kim (Pharmacy)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 916
Presentation Time: April 10-14 on Conference Website

Monitoring of Caucasus Heritage Sites Facing Cultural Genocide

Author(s):

Peyton Edelbrock† (Liberal Arts)

Abstract:

In 2020, a war in the disputed territory between Azerbaijan and Armenia called Nagorno-Karabakh erupted. Because of this war, thousands of people were displaced from their homes and many others died. Along with human casualties, historical sites in the region suffered damage as well. Hundreds of Armenian heritage sites were transferred to Azerbaijani control along with territories ceded to them in the Russian-brokered cease-fire agreement. Along with historical sites being destroyed during the war, the Azerbaijani government is attempting an erasure of Armenian history in the region by marking their churches and other monuments either as nonexistent or as "Caucasian Albanian" instead of Armenian. Using a program called ArcGIS and creating an intersection of technology with anthropology, we are able to monitor over 240 heritage sites over an area of 12,000 kilometers through satellite imagery. This project aims to hold those who have destroyed cultural heritage sites accountable for their actions, to inform the public about the events occurring in the region, to make sure that the history is not falsified, and to possibly deter perpetrators from further destruction of these sites.

Mentor(s):

Ian Lindsay (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 917
Presentation Time: April 10-14 on Conference Website

Class Clustering

Author(s):

Lakshay Goel† (Engineering); Dheeraj Kumar‡ (Polytechnic Institute)

Abstract:

User behavior is one of the most crucial things to understand and interpret whenever it comes to making any significant improvements to an existing system. One of the best ways to achieve this is by performing clustering to study the relationship between different kinds of users and their interaction with the software. This is precisely what the agenda of this research project was. The nanoHUB system uses two distinct algorithms for its class cluster analysis which were developed by two of the most talented members of the team, Michael and Xufeng. The first clustering algorithm is 'core_quick_cluster_detection' where every user is assigned a satisfaction score (z_satisfaction) and then users are clustered together into groups based on that score. The second algorithm is 'core_classroom_detection' which uses the sklearn library's agglomerative clustering feature to group users into different classrooms. The way agglomerative clustering works is that it treats every user as a cluster and tries to merge them into groups based on the criteria provided. Although not completely perfect, these algorithms produce fascinating and highly informative outputs that could further be analyzed and worked upon. The results achieved using these algorithms have helped in finding different classrooms and environments where these tools are being used. These findings allow the nanoHUB's team to market highly used tools in various classrooms to keep users engaged on the nanoHUB site and enhance the user experience overall.

Mentor(s):

Gerhard Klimeck (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 918
Presentation Time: April 10-14 on Conference Website

IoT and Edge Processing for Manufacturing Safety

Author(s):

David Gonzalez† (Engineering)

Abstract:

One of the biggest industries in the world is the manufacturing industry of goods and products. Around the world today, 340 workers die every day due to hazardous working conditions. Many of which cannot be detected unless a device is installed to record data regarding safe atmospheric conditions in the workplace. Our IoT and Edge Processing Research Team is focusing on developing a device that will be able to detect a variety of different atmospheric conditions with the goal of preventing hazardous workplace conditions. The Hardware team is specifically focused on making a compact and reliable device that can be easily mounted on a wall and connected into an ethernet cable.

Our goal is to design a printed circuit board for our device that will mount all necessary sensors and components in a compact manner that will read important atmospheric data accurately every 5 seconds. We are planning to have multiple data-collecting devices that will forward device data to a machine learning algorithm that is used to predict potential safety threats. Our device will then notify the end user in real-time of any potential safety concerns. This involves having a stable voltage supply and a stable connection to the internet for storing device data on a database in the cloud. Our device will allow for safe manufacturing conditions and help prevent accidents before they happen by using a machine learning system that analyzes conditions and determines hazardous conditions based on data from atmospheric sensors.

Mentor(s):

Matthew Swabey (Engineering); Jaeeun Kim (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 919
Presentation Time: April 10-14 on Conference Website

Silicon Photonics Integrated Circuits

Author(s):

Kyle Graham† (Engineering); Yolanda Chen† (Engineering)

Abstract:

Silicon Photonics Integrated Circuits (PICs) can enable low cost, small size, and high complexity solutions for many applications such as telecommunications, sensing, and quantum computing. An indispensable component in PICs are phase shifters. Allowing one to control the relative phase of light in an on-chip waveguide. For silicon PICs, phase shifters typically use the thermos-optic effect by which the refractive index modulation (and therefore phase modulation) is related to the temperature of the waveguide. In this work, we consider different thermo-optic heater architectures for silicon PICs and compare their thermal tuning efficiency using the finite-element heat transport solver Lumerical HEAT. Our target application is for arrays of thermally tunable microring resonators, where the resonance frequencies of each microring can be controlled by an in-ring thermos-optic phase shifter.

Mentor(s):

Luke Cohen (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 920

Presentation Time: April 10-14 on Conference Website

UVM Process and Applications

Author(s):

Avanish Karlapudi† (Engineering); Pranay Jaggi† (Engineering)

Abstract:

UVM, which stands for Universal Verification Methodology is a standardized methodology for verifying digital designs. UVM offers a library of pre-built verification components, guidelines, and recommendations for developing test benches. It is primarily based on Object-Oriented Programming (OOP), using SystemVerilog hardware description language. The main goal of UVM is to simplify the verification process by providing a framework for creating maintainable and scalable test benches, which can reduce the verification time and effort for more complex designs. This project's primary goal is to extend the SoCET UVM tutorial currently provided and apply it on an RTL block such as an adder. In order to do this, we will bring up a test plan and testbench. The testbench will create and execute test sequences to test the adder functionality and cover as many possible cases to ensure the adder is working as expected. By completing this, we hope to gain a wide background on the general UVM structure and an understanding of how to create a test bench to fully verify a design.

Mentor(s):

Mark Johnson (Engineering); Sarang Pramod (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 921
Presentation Time: April 10-14 on Conference Website

Developing Methods to Automatically Detect Rebrightening Events in the Zwicky Transient Facility (ZTF) Survey Data

Author(s):

Shiqi Kuang† (Science)

Abstract:

The Zwicky Transient Facility (ZTF) is a survey study of the optical night sky using a wide-field camera view making periodical observations of each location in the night sky every two days. The changes in the night sky which are detected are processed and stored by astronomical data brokers such as ALeRCE. Given the large scale of data coming out of ZTF, it can be difficult to identify transients of interest. The objective of our project is to develop methods to automatically determine whether a transient is demonstrating rebrightening behavior. Causes for rebrightening events include peculiar core-collapse supernovae, tidal disruption events, interactions with circumstellar mediums, and other unclassified special events. We are developing new algorithms using different numerical methods to classify and filter special transients as rebrightening events. By combining our final algorithm with the ALeRCE client, researchers can quickly and precisely search through large ZTF databases to reach these special rebrightening transients. In the future, with much more data provided by LSST filtered through our algorithm, we will be able to identify and study more rebrightening events.

Mentor(s):

Danny Milisavljevic (Science); Ziwei Ding (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 922
Presentation Time: April 10-14 on Conference Website

Efficacy of the Pedagogical, Cultural, and Advocacy Programming at the Purdue University Asian American and Asian Resource and Cultural Center

Author(s):

Michael Kuczajda† (HHS, Liberal Arts, Honors)

Abstract:

This article describes and analyzes the efficacy of the pedagogical, cultural, and advocacy programming that the Asian American and Asian Resources Cultural Center (AAARCC) provides. Founded in 2015, the AAARCC carries on the work of past groups and individuals in the goal for pedagogical, cultural, and advocacy programming to help educate everyone on campus. Through survey analysis, archival study, and participant observation, my research

shows that the AAARCC have contributed in meaningful ways in areas of pedagogy as well as areas of history and more current issues. efficacy could be improved by increasing the amount of space, such as by providing a bigger and more encompassing facility, increasing the number of scholarships and awards, both national and campus-wide and increasing the visibility on campus. These results are significant because it can allow for better program efficacy in the future as well as reach more students. These extra resources would not only aid the AAARCC in providing better and more effective support for students, but it would also allow for more community engagement, both on and off campus.

Mentor(s):

Pamela Sari (Purdue University)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 923

Presentation Time: April 10-14 on Conference Website

Designing a Hardware Abstraction Layer for AFTx07

Author(s):

Garrett Lail† (Engineering); Pu-Wei Lee† (Engineering)

Abstract:

The construction of complex systems necessitates abstraction. Manipulating the minutiae of computer hardware, for example, provides no benefit to a hardware-inexperienced software developer – instead, serving to slow and complicate the process of development. Thus, a Hardware Abstraction Layer (HAL) – which provides a feature-set of readily-understood functionality to manipulate hardware for software purposes – is vital to software development for a microcontroller device. The intent of the SoCET HAL project is to simplify the platform-specific functionality of the custom AFTx06 and AFTx07 system-on-chips with a layer of functions exploitable by software developers. Each sub-system of the chip will be driven by custom HAL instructions meant to simplify the process of hardware interaction. The focus of the project is split between the runtime of the chip, expanding access to an interrupt manager and embedded-focused data structures, and the peripheral drivers, providing programmers with intuitive methods to modify configurations for communication protocols like GPIO, I2C, and PWM. Two central libraries, an interrupt manager and a pulse-width modulation (PWM) driver, were first developed. To implement this functionality, an object-oriented approach in C++ was taken. Then, testing was performed by simulating the hardware of the AFTx07 chip using the open-source software, Verilator. The interrupt manager and PWM drivers represent a first step to simplify AFTx07 programming. Further work includes expanding the feature-set offered by the HAL as well as polishing its syntax and accessibility to provide a more intuitive programming interface.

Mentor(s):

Cole Nelson (Engineering); Mark Johnson (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 924
Presentation Time: April 10-14 on Conference Website

Development of a Mental Workload-Based Adaptive Training Curriculum for Robotic-Assisted Surgery

Author(s):

Iris Layadi† (Engineering)

Abstract:

The recent increase in robotic-assisted surgical (RAS) usage and implementation has highlighted the need for a more comprehensive RAS training curriculum. Existing surgical training procedures promote self-management techniques, which are ambiguous and often misdirect trainees’ focus. While there has been development on improving RAS curricula, recent proposals fail to address the role of trainees’ mental workload (MWL) on their technical performance and inter-individual trainee differences in optimizing their learning curve and training efficiency. Excessive cognitive workload often leads to decreased situational awareness, impaired decision-making, and poor task performance, all of which contribute to increasing medical error probability. Similarly, given the steep learning curve for RAS, adopting customization in training modules will help cater to individual learning needs and facilitate a more robust training protocol.

To address these gaps, the current study proposes an adaptive curriculum that allows for automatic modification of training order based on trainees’ MWL. A pilot study was conducted with novice test participants from the campus population using the da Vinci Research Kit to test the effectiveness of the proposed curriculum. Participants performed a complex surgical task, followed by a group of subtasks in 1) self-selected order for the control group, and 2) an order tailored to each individual's MWL measurements and rating for the treatment group, before repeating the same complex task. Performance was compared between the two groups to determine and highlight the potential of implementing the adaptive training curriculum in reducing MWL and improving clinical outcomes against traditional, self-managed training methods.

Mentor(s):

Denny Yu (Engineering); Jing Yang (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 925

Presentation Time: April 10-14 on Conference Website

Universal Verification Methodology on Advanced High-performance Bus Components

Author(s):

Xinting Li† (Engineering); Jiaxuan Han† (Engineering)

Abstract:

The System-on-Chip Extension Technologies (SoCET) VIP team is planning to build a customized System-on-Chip design, AFTx07, with the intent for fabrication at the end of the semester.

Pre-silicon verification process is essential to verify the correctness and functionality of the customized design. Advanced High-performance Bus (AHB) is a major component of the AFTx07 design, thus thorough testing is required. AHB is a bus interface suitable for high-performance synthesizable designs. It implements the features required for high-performance, high-clock frequency systems including burst transfers, single clock-edge operation, non-tristate implementation, configurable data bus widths, and configurable address bus widths. AHB defines the interface between components, such as managers, interconnects, and subordinates. A manager provides address and control information to initiate read and write operations, and thus a verification on the AHB manager is necessary. The AHB-to-APB bridge is an AHB subordinate, providing an interface between the high-speed AHB and the low-power APB. Read and write transfers on the AHB are converted into equivalent transfers on the APB. The verification will test the signals that the AHB manager handles in the transactions, and AHB to APB bridge transaction signals. The Universal Verification Methodology (UVM) tool is a standardized methodology for verifying integrated circuit designs.

Mentor(s):

Mark Johnson (Engineering); Sarang Pramod (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 926
Presentation Time: April 10-14 on Conference Website

Power Management- Verification

Author(s):

Ya-Han Lin† (Engineering)

Abstract:

This project aims to develop a power management system for chips using clock gating, which reduces power consumption while maintaining the chip's performance and improving overall efficiency. To ensure the system works correctly, a verification process using the Universal Verification Methodology (UVM) will be implemented. UVM is a standardized methodology for verifying digital designs that can improve verification efficiency and reduce development time.

The verification process will involve deciding the design that will be under the test, creating a test plan and a top testbench diagram, and setting up the verification environment and tasks by coding on other verification components (drivers, monitor, sequencer, scoreboard…etc.), and analyzing the coverage report to check whether the design is meeting its intended requirements to verify the clock gating module and other automatic clock gating components in the system.

The verification process will help ensure that the system is functional to achieve the goal of reducing power consumption and improving the system's overall performance.

Mentor(s):

Sarang Pramod (Engineering); Mark Johnson (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 927
Presentation Time: April 10-14 on Conference Website

Are current restoration projects efficient for combatting deforestation?

Author(s):

Lesedi Manyothwane† (Science)

Abstract:

The purpose of this essay is to evaluate how effective are restoration projects are for combating deforestation as billions of natural wildlife have been recently demolished over the past few decades. For example, tropical dry rainforests have been reduced to 34.9% of their global coverage several decades prior (Calvo-Alvarado, 2009). In the Belém Area of Endemism 56% of its native bird population responsible for seed dispersion are endangered, further risking the chance of restoration (Fellipe de Moraes, 2020). To reverse these effects, many international organizations have made enacted projects for replanting trees in areas of deforestation. However, these projects have several flaws which hinder their long-term benefits to different ecosystems including a lack of diversity in tree species planted or preventative measures for future deforestation (Siqueira, 2015). Thorough research of restoration projects and their flaws will be vital for further actions in reversing deforestation.

Mentor(s):

Qian Wang (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 928
Presentation Time: April 10-14 on Conference Website

Presentation Withdrawn.

Virtual Presentation Abstract Number: 929
Presentation Time: April 10-14 on Conference Website

Standard improvements to policy for maintaining a high leasing rate on commercial properties

Author(s):

Scott Morical† (HHS, Honors)

Abstract:

Within a real estate company, I by leading a team of interns (company requested confidentiality regarding participants as well as name and exact properties), aimed to bring new ideas to the company to fix five uniquely lower performing properties and if the issues causing the low performance were individual, or shared and as such could increase productivity over a portfolio of properties. Our approach was multi-faceted and included industry standard research techniques such as a marketing void analysis, but also incorporated a wide range of independent research on how the property's physicality and leasing size impacted its allure. From those actions we sorted and created a list of potential new tenants based on the surrounding area and the expressed strengths of the property. Additionally interviewing the leasing agents responsible for the marketing of each of the properties for an expert view point. Our recommendation based on our research was for the company to adopt an existing automation software for contacting future tenants, retaining current tenants, and receiving feedback from surrounding communities to increase efficiency, drive occupancy, and address issues in the physicality of properties that were causing lower interest in leasing. This is in addition to opportunities for improvement that were suggested for each of the individual properties based on their location and future growth potential.

Mentor(s):

Kerrie Cossell (Kite)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 930

Presentation Time: April 10-14 on Conference Website

Hybrid Membrane Dehumidification and Dewpoint Evaporative Cooling for Sustainable Air Conditioning

Author(s):

Maisha Mumtaz† (Engineering)

Abstract:

In the United States, approximately 46% of total building energy consumption is attributed to heating, ventilation, and air conditioning systems (HVAC), and 21% of electricity consumption in the commercial and residential sectors is due to space cooling. With the added issue of global warming, cooling and dehumidification loads are expected to increase further in the future. Current practices involve using a vapor compression cycle to cool and dehumidify air through an energy-intensive process using environmentally hazardous refrigerants contributing to global warming. The combination of membrane-based dehumidification and dewpoint evaporative cooling prevents the energy-intensive process of moisture condensation, while also avoiding the use of harmful refrigerants. This paper presents a complete thermodynamic model of a hybrid system that combines a vacuum membrane dehumidifier inspired by the Claridge-Culp-Liu (CCL) cycle with a dew point evaporative cooler. To investigate the system performance, a parametric study is performed for different ambient conditions. Results show the maximum achievable coefficient of performance (COP) for the system to be as high as 15.0, with a median value in the range of 4.0. The system also displays the potential for having a self-sustaining water supply for cooling, producing up to 12x the amount of water required for the evaporative cooling portion of our system in highly humid conditions. An energy savings analysis yielded positive savings at low humidity conditions when compared to the traditional vapor compression system. Additionally, the system outperformed the desiccant system under all conditions. The absence of harmful refrigerants lowers greenhouse gas emissions for the M-DPEC system to as low as 50% of the baseline vapor compression system. The model shows potential in efficiently fulfilling building energy demands while employing an environmentally friendly method to reduce greenhouse gas emissions.

Mentor(s):

David Warsinger (Engineering); Andrew Fix (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 931

Presentation Time: April 10-14 on Conference Website

Analysis of predicting LATEX symbols for mathematical equations using TrOCR model

Author(s):

Yuka Nakamura† (Science, Honors)

Abstract:

This research project aimed to improve the recognition of mathematical equations in various software by using TrOCR, a neural network model developed by Microsoft. The TrOCR model consisting of an image Transformer encoder and text Transformer decoder were trained on two datasets. The first dataset included 150 images of diverse mathematical equations, including fractions, summations, and logarithms, along with their respective LATEX representations. The second dataset contained 36 images of simple mathematical equations that could be expressed in LATEX notation with symbols that did not require the "\ " LATEX notation, such as addition, subtraction, and exponents. The difference in two datasets enabled to observe how different concentrations of similar equation types impacted the training of the models, thus, the accuracy of prediction LATEX notations by the models. Model B, trained with the second dataset, showed higher accuracy in predicting LATEX notation, with lower training and validation loss, and character error rate compared to Model A trained with the first dataset. This difference in performance could be attributed to Model B's repetition of equations that use the same symbols, allowing the model to learn the pattern repeatedly. In contrast, Model A contained a range of symbols, making it more challenging to recognize the pattern. In conclusion, in order to fine-tune TrOCR for accurate recognition of different equations with a variety of mathematical symbols, a larger number of datasets that repeat LATEX symbols should be used.

Mentor(s):

Gang Shao (Libraries)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 932
Presentation Time: April 10-14 on Conference Website

NeuroArt: Presenting a Visual Tool for Self-Regulation

Author(s):

Emma Niecikowski† (Liberal Arts, Science, Honors)

Abstract:

The art of self-regulation is a key concept in meditation and useful for everyday application, as it reflects one's ability to manage their emotional state and their brain activity. Through the creation of the Calm and Focus apps, Dr. Petronio Bendito and Dr. Tim Korb present a visual tool for users to gauge their brain activity and attempt to optimize their results to achieve calm and focus. Users wear an electroencephalogram (EEG) and its electrodes captures alpha, beta, gamma, and delta brain waves and send them to the app to display the signals visually. The apps portray these states in an artistic way: the focus app shows a dot that moves to the center as symmetry is achieved, and the calm app displays color gradients that shift from red to blue tones as brain activity lowers. Most recently, the NeuroArt project was displayed at a university in Thailand and user learned methods that promote self-regulation, including stretching and restful awareness. In this paper, an overview of the project is presented.

Mentor(s):

Petronio Bendito (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 933
Presentation Time: April 10-14 on Conference Website

Dynamic Modeling and Analysis of an Oxygen Generation Assembly for Future Deep Space Habitats

Author(s):

Zoe Noble† (Engineering, Honors)

Abstract:

The purpose of this project was to model an Oxygen Generation Assembly (OGA) for use in a future deep space habitat. The OGA system model, constructed in MATLAB Simulink, consists of three subsystems: the habitat, an air concentration sensor, and the oxygen generator. These systems simulate changes in oxygen levels over time inside the habitat and return said information to the user. The habitat subsystem simulates changes in air composition over time based on various boundary conditions, including the number of crewmates, their consumption of oxygen and exhalation of carbon dioxide, and the habitat's boundary conditions such as temperature, pressure, and volume. A sensor reports the air concentrations to the user and to the OGA. The oxygen generator simulates the process of electrolysis, separating water into hydrogen and oxygen, and sending the oxygen to the habitat. The controller, modelled as a PID feedback controller, determines the rate of oxygen generation based on the oxygen levels obtained from the habitat. The habitat model reports data in the form of percentages of O2, N2, and CO2 currently in the air to the controller. To avoid continuous operation of the OGA and conserve power, to controller utilizes a deadband between 19% and 23.5% oxygen in the air. This generator model has been integrated into the larger Environmental Control and Life Support System (ECLSS) model from Purdue's Resilient Extra Terrestrial Habitats Institute (RETHi) to enable sustained life on another planet.

Mentor(s):

Davide Ziviani (Engineering); Seungho Rhee (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 934
Presentation Time: April 10-14 on Conference Website

Design and implementation of advanced UART communication protocol for custom SoC

Author(s):

Ben Owen† (Engineering, Honors); Burkay Sahin† (Engineering); Nicolas Jimenez† (Engineering)

Abstract:

Our group focused on designing, testing, and implementing a UART communication protocol on AFTx07, the new RISC-V-based microcontroller currently developed by the System-On-Chip Extension Technologies team. UART is a commonly used asynchronous serial communication protocol popular due to its simplicity and reliable data transmission. Although widely replaced by USB in consumer devices, UART is still commonly used in embedded applications for tasks such as data logging and debugging. We used SystemVerilog to describe the hardware necessary for the protocol, utilizing the digital libraries in the FuseSoC to implement simple lower-level modules and ensure smoother integration with the rest of the AFTx07 design. Our design implements traditional UART features such as transmit and receive blocks in a full-duplex configuration with adjustable interrupts, data bit lengths, and more complex components, including adjustable baud rate and clear-to-send/ready-to-send signals for reliable communication with external peripherals. Verification of the hardware was performed using SystemVerilog test benches to ensure that the design worked in various real-world scenarios, such as imprecise clock periods between devices and erroneous data packets.

Mentor(s):

Mark Johnson (Engineering); Cole Nelson (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 935
Presentation Time: April 10-14 on Conference Website

Gun Legislation In The US

Author(s):

Samuel Park† (Polytechnic Institute)

Abstract:

The discussion around gun legislation isn’t novel in the US; many Americans have strong opinions and arguments around the issue. Many people fail to see both sides of the subject and often disregard the other side's thoughts. The topics presented in this article go over why the US should pass stricter gun policies and the benefits it would bring to society. Researchers have explored the complexities of the issue, conducted several surveys, and the impact that the government and firearm companies have. It was found that the firearms industry has a large impact on the government and the American public supports stricter gun laws.

Mentor(s):

Qian Wang (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 936

Presentation Time: April 10-14 on Conference Website

3D Printing of Concrete

Author(s):

Aarya Patel† (Engineering, Honors)

Abstract:

3D printing has made tremendous strides in the past couple of years. We are trying to develop a modern way to construct infrastructure by integrating 3D printing with conventional ways. We would use a 3D printing mechanism to lay down concrete for precise and fast construction. This would not only reduce the need for human labor but would significantly cut down on construction time. It would also help in constructing habitats in hard-to-reach areas for humans.

Mentor(s):

Yu Wang (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 937
Presentation Time: April 10-14 on Conference Website

Apollo 17: The Mission's Historical and Geological Footprints

Author(s):

Kat Payne† (Liberal Arts)

Abstract:

This interdisciplinary research project was a collaboration between Purdue Libraries' Archives and Special Collections (ASC) and the Department of Earth, Atmospheric, and Planetary Sciences (EAPS) that resulted in a public exhibition. The ASC team conducted Apollo 17 primary source research to contextualize the Apollo missions and Purdue's contributions to space exploration. The EAPS team studied Apollo 17 lunar samples to examine the impact of solar wind and space weathering on the lunar surface. Apollo 17 was the first Apollo mission to include a scientist, Jack Schmitt. This created opportunities for people from disciplines other than engineering and aeronautics to become astronauts. Utilizing personal papers and artifacts, two undergraduate history students, Kat Payne and Peyton Edelbrock, conducted research alongside the Barron Hilton Archivist for Flight and Space Exploration, Tracy Grimm. Meanwhile, scientific research was performed in an EAPS laboratory led by Doctor Michelle Thompson and two undergraduate research assistants, Daniel Garcia and Kasidi Lowry, as well as graduate students, James McFadden and Alex Kling. The teams met weekly to gain hands-on-experience in each other's disciplines to further their understanding of extraterrestrial geology and historical implications. It is valuable for Purdue University to acknowledge the achievements of its alumni–such as Apollo 17 Commander Eugene Cernan–to inspire current students and the public. The fall 2022 exhibit attracted Purdue students, alumni, and community members to learn more about the university, its relevance to the United States' contributions to space exploration, and the technological, social, and scientific aspects of sending astronauts to the lunar surface.

Mentor(s):

Tracy Grimm (Libraries); Michelle Thompson (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 938
Presentation Time: April 10-14 on Conference Website

It's Never Too Soon! Comparing Intercultural Learning Outcomes of Undergraduate Students via Face-to-face and Online Teaching Modalities

Author(s):

Annika Schenkel† (HHS, Honors); Tanvi Inani† (Liberal Arts, Management, Honors)

Abstract:

Purpose: Providing culturally responsive care for a diverse patient population is critical for future speech-language pathologists (SLPs) and audiologists. Prior studies have shown gains in intercultural competence (ICC) from study abroad programs, face-to-face classes and online courses; however, limited studies have investigated differences between face-to-face and online mode of delivery in SLP and audiology. The purpose of this study was to 1) evaluate whether there are differences in development of ICC in a direct comparison of a face-to-face and 100% asynchronous online introductory in communication disorders, and 2) to examine participant perceptions of their own learning through the ICL activities embedded in the course.

Method: The study used a mixed-methods approach collecting both quantitative (Intercultural Development Inventory®) and qualitative (reflection papers) data. Data analysis included t-tests and clustering analysis of quantitative data, and scoring and thematic analysis of qualitative data.

Results: Results demonstrated statistically significant increases in IDI® scores for participants in both the online and face-to-face classes. Qualitative analysis indicated that all participants, regardless of change in score, demonstrated growth in ICC as seen in their comments.

Conclusion: Overall, structured ICL activities embedded within a course can be an effective means of facilitating intercultural growth in participants in both face-to-face and online instructional modalities. Additionally, participants whose quantitative scores declined had similar qualitative comments suggesting intercultural growth in all participants independent of changes in quantitative scores.

Mentor(s):

Christi Masters (HHS); Aletha Stahl (Liberal Arts); Aparajita Jaiswal (Purdue University); Muna Sapkota (Education)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 939
Presentation Time: April 10-14 on Conference Website

Black Games Archive

Author(s):

Joanna Senff† (Exploratory Studies)

Abstract:

This is an archival project that seeks to compile a list of video games that are “textually, contextually, or representationally Black” (according to the definitions and guidelines created by Dr. Blackmon). The work includes the creation and maintenance of databases and websites as well as learning to evaluate and analyze videogames as cultural artifacts. As the project continues, curating exhibits and archives as meaning making activities may occur. In the end, it will help to provide insight to a list of Black games in an organized manner, being an easeful way to learn more about videogames and Black culture.

Mentor(s):

Samantha Blackmon (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 940
Presentation Time: April 10-14 on Conference Website

SigStore

Author(s):

Sreevickrant Sreekanth† (Engineering); Daniyal Fazal‡ (Engineering); Pulkit Hement Chhabra‡ (Engineering); Aron Gebre‡ (Engineering); Letter Wang‡ (Engineering)

Abstract:

Sigstore, formerly Project Rekor, is part of a new, experimental product to provide "software supply chain transparency" --- the ability for software producers to identify software components throughout different vendors, communities, and sub-organizations. With this, high-assurance software products are able to identify counterfeit software, decommission vulnerable code, and stop hackers trying to poison software delivery pipelines. The sigstore team works in system building, security evaluation, and deployment of test infrastructure. There are three parts to this project. The first part, le-git-imate, develops a defense mechanism to mitigate attacks against web-based Git hosting services such as GitHub and GitLab. le-git-imate pioneers the ability to sign a web UI commit and thus create a true GPG-signed Git commit object in the browser. The second part, sigstore, builds a tool for developers, software maintainers, package managers, and security experts. Bringing together free-to-use open-source technologies like Fulcio, Cosign, and Rekor, it handles digital signing, verification, and checks for provenance needed to make it safer to distribute and use open-source software. The third part, rekor-monitor, works as a module that monitors Rekor, which is a technology used in sigstore as the second part. It records the working condition of Rekor, and it is written in Go.

Mentor(s):

Santiago Torres Arias (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 941
Presentation Time: April 10-14 on Conference Website

Vehicle Repossession: The Effects of Social Isolation in a Car-Centric Society

Author(s):

Abigail Taylor† (HHS, Liberal Arts)

Abstract:

Tens of millions of Americans are newly unemployed, facing unprecedented financial hardships, and numbers expecting to grow due to distressing events such as the COVID-19 pandemic. Automobiles are U.S. households' most valuable piece of movable property and is also essential to households' income-earning capacity. This constitutes a paradox: when people do not pay their bills, their vehicles are repossessed, which creates a new obstacle to financial solvency and social isolation. Since previous research has not documented or analyzed repossession, and existing literature on the subject is limited, this research seeks to address the paradox, gathering social scientific evidence about the repo process and its consequences. Three primary questions this research aims to answer are: (1) How are new technologies shaping repossession? (2) How does repossession affect present and future socioeconomic disadvantage? (3) What can vehicle repossession teach us about the reliance on vehicle transport for social interconnectivity, and how can those findings inform preparations for and responses to future crises? This study documents vehicle repossession in the Midwestern U.S. through ethnographic observations, semi-structured, qualitative interviews with repossession targets to address questions 2 and 3. To analyze data, we used broad index codes to identify major themes. Our results showed that, in a car-centric society, vehicle repossession and loss can disproportionately affect marginalized communities, socially isolating and disconnecting them from the rest of society. Focusing on the lens of social isolation, this research offers important insights about what repossession means for social conditions and economic opportunity.

Mentor(s):

Spencer Headworth (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 942
Presentation Time: April 10-14 on Conference Website

Two-Phase Flow loop system design and assembly

Author(s):

Keerthi Krishna Reddy Thummuru† (Engineering)

Abstract:

With the increase of the total chip power as well as the chip size shrinking, the chip power density becomes higher and higher. Single-phase electronic cooling solutions such as microchannel cooling and impingement jet cooling are developed to solve the thermal challenges. However, as the chip power density keeps increasing up to 1kW/cm2, these single-phase designs are unable to keep up with dissipating the generated heat properly. Considering this, the development of better cooling systems, such as a two-phase cooling system, is required. This project's objective is to help develop state-of-the-art two-phase flow loop systems to solve the thermal challenges of the future high-performance computation system. The designed flow loop systems were made primarily using 316 Stainless steel Components in order to increase the corrosion resistance of the pipe systems. The systems were designed to work in a temperature range of –20° to 150° C and a working pressure of 3300 PSI. The system was fitted with a range of Thermocouples, Pressure Transducers, and Flow Control valves with the purpose of providing access to a range of high-resolution measurements and significant control over several aspects of the flow within the loop. Moving forward, Custom electric panels and LabVIEW Systems will be used as the user control interface. The expected results of this project are to have fully functional two-phase Flow loops ready to use, with the two-phase system expected to provide about 50% better cooling. Further studies will be conducted on two-phase jet impingement cooling using these flow loop systems.

Mentor(s):

Tiwei Wei (Engineering); Zheng Gong (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 943
Presentation Time: April 10-14 on Conference Website

Characterization of MLO13 in Arabidopsis thaliana

Author(s):

Lucas Urquiaga† (Agriculture)

Abstract:

The Mildew Resistance Locus O(MLO) protein family is involved in various plant functions, including pollen tube directional-growth and root tropism. Members of the MLO protein family have different subcellular localizations which might affect their function. MLOs were recently identified as Ca2+ -permeable channels that are negatively regulated by calmodulin. This experiment aims to better understand the function of MLO13(an uncharacterized member of the MLO protein family) in plants by phenotyping mutants, obtaining subcellular localization data, and creating stable overexpression lines for MLO13. Single cell-cell RNAseq experiments in roots revealed that MLO13 is expressed specifically in phloem. In this experiment we will be phenotyping mutant MLO13 under different conditions. We will determine subcellular localization by inserting MLO13 into a destination vector containing GFP and a 35s promoter via an LR reaction in order to clone a 35s::MLO13-GFP destination vector. This vector will be used for expression in tobacco with organelle markers to obtain subcellular localization data.

Mentor(s):

Sharon Kessler (Agriculture); Sienna Ogawa (Agriculture)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 944
Presentation Time: April 10-14 on Conference Website

Women of Nowadays: Gender, Modernity, and Symbolic Boundaries in a Generalized AIDS Epidemic

Author(s):

Shaulay Ward† (HHS, Liberal Arts)

Abstract:

Abstract:

What does it mean to be a “modern woman”? Amid a context of economic inequality, social change, and a health landscape dominated by HIV risk, women in rural South Africa contend with two conflicting constructions of womanhood, both of which are constraining in their reinforcement of gender inequality. Whereas “cultural women” are constructed as abiding by longstanding gender norms and are committed to the fulfillment of tradition, “women of nowadays”—who do neither—are deemed both an aspiration and a cautionary tale. To better understand these discourses and their implications for rural women, we analyze interview and focus group data from 121 women across two qualitative studies conducted in 2010 and 2015 in rural northeast South Africa. Our findings show that although our participants aspired to the higher education, financial security, and independence associated with modern women, they rejected this path because of the associations between modern women and the spread of HIV. We argue the discourse of “women of nowadays” ultimately serves as a symbolic boundary that differentiates women along lines of respect vs. autonomy and tradition vs. modernity. Ultimately both constructions of womanhood reflect and maintain existing gender hierarchies.

Mentor(s):

Christie Sennott (Liberal Arts)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 945
Presentation Time: April 10-14 on Conference Website

CSME MRAM Controller

Author(s):

Htet Yan† (Engineering); Alex Chitsazzadeh‡ (Engineering); Vishnu Lagudu‡ (Engineering)

Abstract:

Magnetoresistive random-access memory (MRAM) is a type of non-volatile memory that stores data in magnetic domains. Unlike conventional RAM chips, data is MRAM is not stored as an electrical charge, but by magnetic storage elements. These magnetic storage elements in the MRAM make it susceptible to external threats. The purpose of this project lies in being able to achieve a procedure to maintain the integrity of the data stored in the MRAM. The proposition is to sacrifice a certain amount of memory cells in the MRAM as sensors. These sensors will be made more susceptible to the external magnetic field. In the event of an attack these "sensors" will bit flip which triggers a protocol to dump the main memory to a safer location on the SOC (system on chip). Memory cells can be made more susceptible through a series of read-and-write instructions done with the help of a microcontroller.

Mentor(s):

Mark Johnson (Engineering); Joerg Appenzeller (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 946
Presentation Time: April 10-14 on Conference Website

RISC-V External Debug Support

Author(s):

Xinyu Yang† (Engineering, Science); Zhaoyu Jin† (Engineering); Steven Andreas† (Engineering)

Abstract:

The technical goal of the SoCET(System on Chip Extension Technologies) team is to produce a family of microcontrollers on custom silicon. Our goal of this project is to design complete hardware support for external debugging on the RISC-V platform. It allows the users to gain a better understanding of what is going on within the hardware, enabling them to better write and debug software. For example, the user can halt the running program and inspect the CPU's internal state to analyze the software’s unexpected behavior. To achieve this goal, we will have hardware modules that translate the software debugging tools’ commands into language understandable by the CPU and control its behavior without breaking the main program. We will be designing these modules using SystemVerilog, a Hardware Description Language which allows us to design hardware by describing it in a software-like syntax. In the end, using simulations and FPGA emulation, we want to demonstrate that our product can perform its debugging role to an extent where the software developers in SoCET will benefit from using it.

Mentor(s):

Cole Nelson (Engineering); Mark Johnson (Engineering); Matthew Swabey (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 947
Presentation Time: April 10-14 on Conference Website

Separating river discharge into rain and groundwater contributions during a large regional storm event: consequences for dissolved organic carbon transport

Author(s):

Yulei Yang† (Science)

Abstract:

Knowing the source of water in a river or stream is important to critical zone hydrology and understanding river export of carbon and nutrient for example. Hydrograph partitioning is a way to differentiate baseflow and storm flow of a river or stream during a storm event. In this project, the hydrograph of a storm event in October 2021 in 4 streams/rivers in the Sangamon River will be partitioned using stable water isotopes as tracers. River samples collected from 4 sites are prepared and analyzed for stable water isotopic compositions using a Los Gatos Research Liquid Water Isotope Analyzer. Then, the δ18O and δD values before, during, and after a storm event are investigated and compared. Next, by using the data of discharge and gage height from 4 sites, a hydrograph is produced with distinguished storm flow and baseflow. This project can help understand the transport of dissolved organic carbon through watersheds during precipitation events.

Mentor(s):

Lisa Welp (Science)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 948
Presentation Time: April 10-14 on Conference Website

A Fast Approach to Estimate Nonlinear Valve Plate Deformation in Axial Piston Machines

Author(s):

Austin Zapata† (Engineering)

Abstract:

Designing efficient hydraulic pumps and motors requires accurate simulation of lubricating interfaces and fluid-structure interaction, where the calculation of the solid part pressure deformation plays an important role. State-of-the-art models use methods only able to capture pressure deformation based on the assumption that the relationship is linear. However, realistic deformation comprises nonlinear characteristics due to separation between two solid bodies. The goal of this study is to propose an inexpensive solver for nonlinear pressure deformation. This study compares three methods for computing deformation within the cylinder block-valve plate interface of an axial piston pump. The highest-fidelity approach leveraged a commercial finite element method (FEM) solver, which allowed nonlinear deformation to be considered. The second approach calculated deformation considering only the linear component using an influence matrix, as done in state-of-the-art tribology models. The third approach, the novel method proposed by this study, decomposed the total pressure into two components: a reference pressure distribution considering only diffusive terms of the Reynolds equation, and the remaining residual pressure. Nonlinear deformation was computed for the reference component and linear deformation for the residual component. Then, the solutions were superimposed to estimate total deformation. Results showed that the proposed approach was able to capture the shape and magnitude of the deformation distribution generated by the commercial FEM solver more accurately than the influence matrix method. This demonstrates the feasibility of accurately estimating nonlinear deformation in lubricating interfaces without the need for a coupled, nonlinear pressure-deformation solver, providing a faster method for computing nonlinear deformation.

Mentor(s):

Lizhi Shang (Engineering); Nathan Hess (Engineering); Swarnava Mukherjee (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 949
Presentation Time: April 10-14 on Conference Website

RTL for Register windowing

Author(s):

FangLing Zhang† (Engineering); Sooraj Chetput† (Engineering); Adrian Persaud† (Engineering); Johnathan Hong† (Engineering); Jin Zhaoyu‡ (Engineering)

Abstract:

The GPU accelerator team is a sub-team within SoCET, which designs and implements “System-on-Chip” devices. GPU (Graphics Processing Unit) is a computer component specifically designed for vector calculations used in AI modeling, video rendering, game production, and etc. The team’s goal is to develop the RTL for a windowed register file for GPUs to calculate performance, and area & power metrics. Registers are on-chip memory which store operands for operations within the GPU. Register file is a file that contains all registers. This is related to operand collector architecture in which collect operands then send out to the execution stage. Windowed register file is a research concept that intends to optimize GPU performance. Register windowing is a process that selects a set of registers inside a larger register file to be addressed more directly by a program which reduces the number of “fill-and-spill” occurrences that happen between function calls. We want to compare the effectiveness of a windowed register file to the ones found on typical market GPUs.

Mentor(s):

Timothy Rogers (Engineering); Mark Johnson (Engineering); Manikanta Tiruveedula (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 950

Presentation Time: April 10-14 on Conference Website

Pre-differentiation exposure of PFBS and PFBA induced persistent changes in DNA methylation in human dopaminergic-like neurons

Author(s):

Xihui Zhao† (Engineering)

Abstract:

Perfluorobutane sulfonic acid (PFBS) and Perfluorobutanoic Acid (PFBA) are abundant in the environment due to their industrial use and consumer products. According to previous research, exposure to high doses of PFBA and PFBS has been associated with delayed development, lower body weight among babies, and a higher risk of neurological disorders. However, research on the influence of low-dose PFBA and PFBS exposure on developmental neurons is unknown. To fill this gap, we expose low-dose PFBA and PFBS (0.4 and 4 μg/L) on dopaminergic (DA)-like SH-SY5Y cells and measure the changes of epigenetic markers. We observed a persistent decrease in H3K4me3 in DA-like neurons differentiated from SH-SY5Y cells exposed to 0.4 and 4 μg/L PFBA and PFBS. Statistically significant decrease in H3K27me3 marker was found in both 4 μg/L PFBA and PFBS. Statistically significant decrease of 5mC marker was found in 4 μg/L PFBS and 0.4 μg/L PFBA. Among the selected epigenetic features, DNA methylation pattern can be used to distinguish between PFBS/PFBA exposed and naïve populations, suggesting the involvement of epigenetic regulation. Collectively, our results indicate that developmental PFBS/PFBA exposure leads to a prolonged effect on the fitness of DA-like neurons. Besides, the persistent change of identified epigenome is associated with higher risks of neurological disease later in life.

Mentor(s):

Chongli Yuan (Engineering); Han Zhao (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

Virtual Presentation Abstract Number: 951
Presentation Time: April 10-14 on Conference Website

Human-Robot Interaction in Future Construction Jobsite

Author(s):

Andrew Borowiak† (Polytechnic Institute)

Abstract:

As the current construction industry is facing a labor shortage, it is expected that advanced technologies (e.g., robots, drones, artificial intelligence (AI)) will be introduced to future construction sites while workers will still be present to interact with them. Although these newly-introduced technologies can reshape the construction sector, additional uncertainties will also be imposed on future jobsites. For example, the technologies might not always be functional, but workers should build proper levels of trust in them. However, how construction workers will be teaming with those technologies in future workplaces is still unknown. Therefore, this research aims to investigate the trust-building between workers and non-human agents by simulating a future bricklaying scenario in a mixed-reality environment.

This study is conducting a user study in which participants needed to finish a bricklaying task with a bricklaying robot (i.e., MULE), different types of drones, and an AI-assistant. The MULE can help workers do the heavy lifting, while the drones can be used for surveillance and material transportation. The AI assistance can provide useful information related to the dynamic objects (e.g., drones) on construction sites. Also, participants were asked to complete the task in different scenarios (i.e., normal, error, time pressure, memory load, and no AI). Subjective (i.e., self-report) and objective (i.e., psychophysiological response) data were collected to evaluate workers' trust levels in each technology. Workers are anticipated to update their trust in technologies based on different scenarios, and the trust levels will also affect their behaviors and performance on the bricklaying task.

Mentor(s):

Sogand Hasanzadeh (Engineering)

† Presenting Undergraduate Author; ‡ Contributing Undergraduate Author; * Undergraduate Acknowledgement

THEMATIC CATEGORIES' TOP ABSTRACTS

Physical Sciences

Comparison of craters in different regions of the Moon and implications for volcanic infilling by Kyle Morin (Poster #573)

Social Sciences/Humanities/Education

Children's Distress During COVID-19 and its Relation with Vocabulary Development at 18 Months by Kathleen Cory & Vivian Lee (Research Talk #761)

Innovative Technology/Entrepreneurship/Design

Assessment of Vehicular Vision Obstruction Due to Driver's Side B-Pillar and Remediation with Blind Spot Eliminator by Dilara Baysal (Research Talk #782)

Fine Arts

Engagement and Outreach Through On-Demand Video by Wesley Dynlacht (Poster #325)

Life Sciences

Evaluating the efficacy of IPM strategies against insect pests of collards by Elliott Masterson & Layton Rosen (Research Talk #721)

Mathematical and Computational Sciences

Creating Robust Artificial Intelligence Models for Medical Imaging by Aditi Anand (Research Talk #770)

Analysis of 4D Cardiac Magnetic Resonance (CMR) Images to Identify Strain Parameters for Early Mortality in Duchenne Muscular Dystrophy (DMD) by Tarun Nandamudi (Poster #377)

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CONFERENCE NOTES

SAVE THESE DATES:

April 18, 2023 | 11am-1pm | PMU South Ballroom:
Celebrate Purdue's Thinkers, Creators, & Experimenters

July 27, 2023: Summer Undergraduate Research Symposium

November 14 & 15, 2023: Fall Undergraduate Research Expo

April 9 & 11, 2024: Spring Undergraduate Research Conference

UNDERGRADUATE RESEARCH

ABSTRACT BOOK