University of Massachusetts Amherst

Fall 2006

Significant BITS

Newsletter of the
Department of Computer Science

Technology Promises Individualized Teaching

Woolf addresses a growing need in education

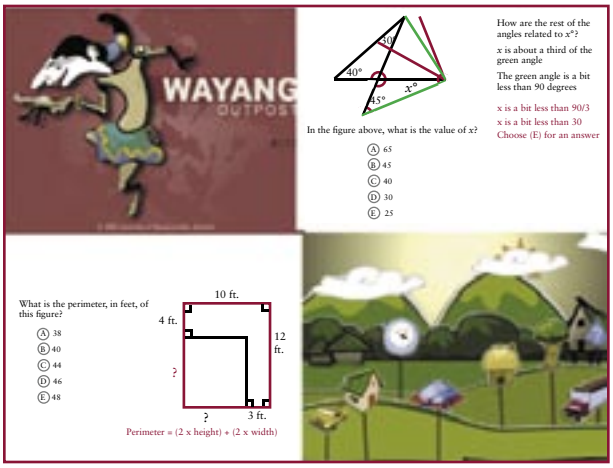

Figure 1. The geometry tutor presents animation hints to mentor students through hundreds of geometry problems.

Education is no longer perceived as a "one size fits all" proposition. Rather, the focus is on tailoring activities to meet the individual needs of an increasingly heterogeneous student population. This seems obvious, yet is nearly impossible to implement in a traditional classroom.

Even though teachers are responsible for more students in the classroom and online, a real possibility exists to produce a private computer tutor for each student, augmenting the teacher's ability to respond to each individual.

Research Professor Beverly Park Woolf is building Web-based intelligent tutors that understand a student's learning needs, optimize teaching materials and use effective tutoring strategies. "These tutors, when used in traditional classrooms with caring teachers, provide the advantages of individualized instruction at an affordable cost," says Woolf.

Machine tutors operate like a trusted mentor, speeding through topics that the student grasps easily, concentrating on topics that cause trouble, and never losing patience. Some research challenges include:

- How does a computer tutor learn to adapt to each student's learning style and cognitive skills?
- How does a computer track student collaboration and identify each student's contribution?

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Towsley receives prestigious IEEE award

Distinguished Professor Don Towsley is the recipient of one of the IEEE's most prestigious honors, the 2007 IEEE Koji Kobayashi Computers and Communications Award. The IEEE Board of Directors chose Towsley for his fundamental contributions to the theory and practice of computers and communication networks.

Towsley's work has significantly furthered the integration of computers and communications systems. His many papers have focused on developing frameworks for the modeling, analysis, and measurement of computer systems and networks.

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RESEARCH

Technology *(from page 1)*

- How does a tutor help unmotivated students to focus on learning?

Behavioral Studies and Student Modeling

Intelligent tutors are predicated on the existence of models of knowledge that represent the key ideas to be learned, common misconceptions, and how a student's knowledge changes over time. Modeling an individual's knowledge is challenging since students' knowledge is often confounded or missing.

Dr. Woolf has built many intelligent tutors in collaboration with colleagues in psychology, chemistry, engineering, biology, ecology, geology, education and medicine.

Some of the most promising tutors were built with Research Scientist Ivon Arroyo and include tutors for elementary and high school mathematics (see Figure 1). The effects on individual learning differences (e.g., mathematical ability) and group characteristics (e.g., gender) were documented by deploying two tutors, AnimalWatch (arithmetic) and Wayang Outpost (geometry), among nearly a thousand elementary and high school students. Large-scale experiments determined the practical significance of each tutor and showed that they have a measurable impact: students who used these tutors for two or three hours improved their results on Massachusetts-required standardized exams by 10-12%.

These multimedia tutors contain nearly 1,000 problems and are supplemented with data about cognitive features of each student, including variables for individual differences. For example, machine learning was used to modify tutor behavior according to each student's Piagetian developmental stage, spatial ability, or math-fact-retrieval skills.

Evaluation results indicate that students with low cognitive skills learn best with concrete representations and manipulatives, and those with higher cognitive skills learn best with abstract or symbolic representations. The effects of gender characteristics in learning have also been measured. Female students spend about 25% more time on hints than male students, perceive a tutor more positively than male students, and are more willing to use the tutor again. Boys with low cognitive development perform worse when they receive abstract or symbolic help while boys with advanced cognitive skills seem to learn better with abstract help than with hints.

In the private context of the tutor environment, students with weak skills benefit the most, seem comfortable requesting hints, make use of help and instruction and demonstrate improved performance. This is the reverse of the usual findings in the classroom, where higher achieving students are most likely to request help.

Learning to Teach

Machine learning (ML) techniques are used to model each student's skills and to optimize the selection of problems and hints. Hierarchical, probabilistic models enhance the tutor's ability to assess a student's skills. The tutor reasons about latent variables, such as prior knowledge and the level of a student's engagement in the tutoring process. Bayesian and data mining techniques help identify a student's skills and predict student reactions to a variety of teaching styles (e.g., present a hint or an example) and to understand how each student learns.

Bayesian nets are used to reason about a student's affective state (motivation, engagement, interest and learning) and to discover links between observable behavior (time spent on hints, number of hints selected) and hidden variables (attitudes and goals). Correlation between observable student activity and survey responses are converted into a network that tests the predictions on the data log of new students.

"Using ML techniques, we can predict a student's level of engagement with 80-90% accuracy, and how a student will perform on each problem with 70% accuracy," says Woolf.

Web-enabled intelligent instruction

Woolf is developing several tutors to personalize Web instruction based on presumed student knowledge, cognitive skills, and learning needs. One intelligent tutor can learn in just a few Web pages how to classify a student's learning needs and which teaching approach to use, on a per-student basis.

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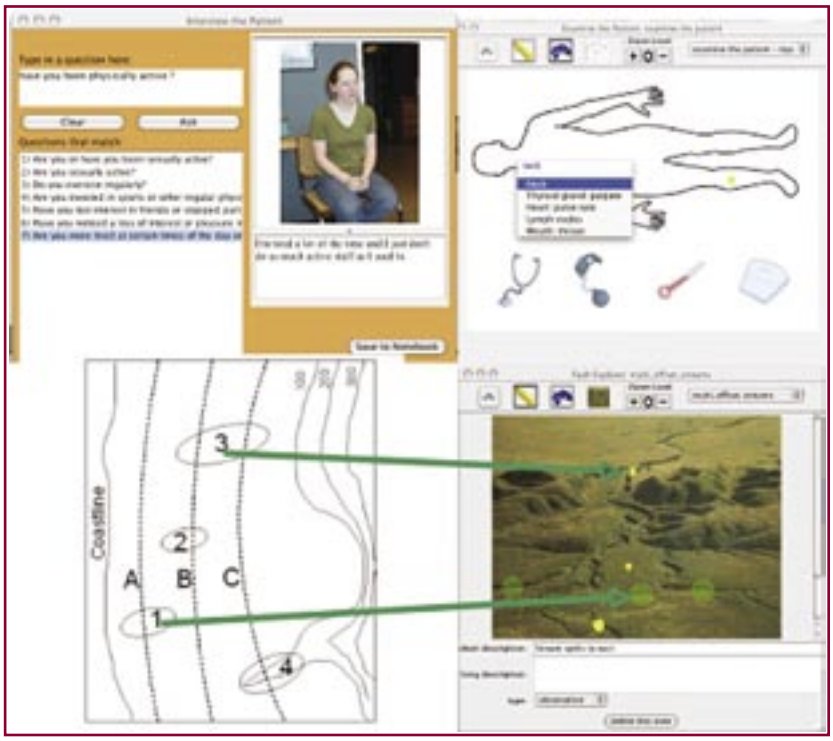


Figure 2. The Inquiry Tutor invites students to solve a medical diagnosis case (top) or to predict the location of the next earthquake (bottom).

FACULTY

Graphics researcher Wang joins CS faculty

Dr. Rui Wang joined the Department this fall as an Assistant Professor. His research is focused on computer graphics, specifically the creation of interactive virtual environments that closely resemble the physical world.

"UMass Amherst is a top-tier school in computer science, with a long history of outstanding research contributions in areas closely related to computer graphics, such as computer vision, machine learning, artificial intelligence, and robotics," says Wang. "I truly appreciate the opportunity to join the Department as a new faculty member, and I feel excited to begin my career in this highly collaborative and supportive environment."

Professor Wang's computer graphics research interests are in global illumination algorithms, real-time rendering, 3D scanning and modeling, graphics hardware, and image processing. His research experience has already spanned a broad spectrum of projects, ranging from building an efficient 3D scanning and reconstruction system to developing an interactive relighting technique that accurately simulates physically-based lighting effects. He has also worked to help implement a fast tone mapping algorithm on modern graphics processing units (GPU) that improves displayed quality of high-contrast images.

Wang's dissertation research was concerned with algorithms for photorealistic rendering that permit the user to manipulate the lighting, viewpoint, or material in real-time. His system exploits pre-computed illumination data to enable fast run-time rendering that simultaneously captures such sought-after effects as glossy surface reflection, realistic shadows, indirect lighting, and translucency. For example, a full rendering of the translucent marble dragon (shown in image) was constructed at 10 frames per second with dynamically changing viewpoint and natural lighting at all frequencies.

In one of Professor Wang's research projects on an efficient end-to-end system for colored reconstruction of 3D scenes, he created a fast and accurate approach to combining multiple 2D range images directly into a 3D volumetric representation, from which he reconstructed the final model and assigned colors and view-dependent textures. He successfully applied the technique to create highly accurate digital models of Thomas Jefferson's *Monticello* for scientific study and exploration.

Wang and his colleagues also implemented a state-of-the-art tone mapping operator on modern graphics hardware. They developed efficient GPU data structures and algorithms for fast image convolution, with broad applications in image processing. This tone mapping system can be used interactively in applications such as realistic rendering, digital photography, and medical imaging.

Translucent marble dragon rendering

"High-quality computer graphics technology is becoming ubiquitous," says Wang. "I foresee many exciting research problems emerging in this area, particularly in accurate modeling of the real-world and interactive photorealistic rendering." An important aspect of his research agenda is the study of efficient data representation and factorization methods that are at the core of precomputation-based rendering algorithms. Wang also intends to focus on the intriguing problem of handling dynamic scenes in these sorts of realistic illumination systems. To continue his previous research on geometric acquisition, Wang plans to investigate methods in material acquisition, such as fast estimation of surface reflectance properties from real-world objects.

"The faculty in this Department have been very friendly and supportive, and the students are enthusiastic and motivated," says Wang. "I am really pleased to see that the Department has provided me with such a great environment to help achieve my career goals."

Dr. Wang received his M.S. and Ph.D. in Computer Science from the University of Virginia (UVA) in 2003 and 2006 respectively, and his B.S. in Computer Science from Zhejiang University, China, in 2001. Before joining the Department, he had a research internship at Intel Research Lab. He was the winner of UVA's 2003 Rendering Competition, and he received the Outstanding Graduation Thesis Award from Zhejiang University in 2001.

2nd annual CS Saturday – a success

On September 30, a crowd of enthusiastic college juniors and seniors filled the Department's colloquium room for its second "CS Saturday" event. They came to hear about what graduate school in computer science is like, to learn about the opportunities that a graduate degree in the field can provide, and to gather information about what is needed for a strong application. Attending were 57 students from Amherst College, Boston University, Dartmouth University, Fairfield University, Howard University, Middlebury College, Mt. Holyoke College, SUNY Albany, Tufts University, University of Connecticut, Wellesley College, Williams College, and UMass Amherst.

The purpose was not only to generate interest among undergraduates in graduate study in computer science and to provide useful information about graduate school, but also to address the under-representation of women and minorities in computer science, a problem affecting computer science departments across the nation and research and education at all levels. "While we focused our marketing on those under-represented groups, we opened the event to anyone who wanted to attend," says Professor Andrew Barto, chair of the department diversity committee. "We were delighted to find 20 women among the attendees."

The event was very successful in providing useful information to potential applicants and in reaching out to under-represented students in the computer science field.

AWARDS

Moll's service commended

At the College of Natural Sciences & Mathematics (NSM) fall convocation ceremony, CS Associate Professor Robert Moll received the NSM Outstanding Service Award for his devotion to service and teaching activities that have advanced the education of generations of computer scientists at UMass Amherst.

Moll served as the Department's Undergraduate Program Director (UPD) from the late 1980s until 2001, when he became Associate Chair for Academic Programs. During his tenure as UPD, the number of CS majors more than doubled. He initiated and implemented policies and practices that allowed the faculty to accommodate this explosion of majors effectively and that not only maintained, but also improved the nurturing and supportive environment that the Department strives to provide for its undergraduates.

One notable initiative that Moll established is the *Bay State Fellowship program*. Under this innovative program, which is funded entirely within the Computer Science Department, any undergraduate who completes a UMass Amherst computer science major with a sufficient overall GPA is automatically granted admission to the Department's Master's program. This admission includes modest guaranteed financial support, plus a tuition waiver. Moll also initiated a vigorous program to help older students "retread" themselves as computer scientists with the establishment of a second Bachelor's degree program.

In over 30 years of service to the Department, Moll took the lead in enhancing the Department's undergraduate program through course and curricular development. His enhancements include modernizing introductory courses in response to paradigm shifts in programming languages, developing the programming methodology course (CMPSCI 287), and instituting a new two-tiered advising system. He is also a significant contributor to the minor program in Information Technology (IT).

In addition to his contributions to the Department's undergraduate program, Moll serves as the official face of the Department to prospective students and their families. He not only meets with prospective new students, but he also has one-on-one meetings with every graduating senior. These exit interviews give faculty valuable feedback on the undergraduate program, leading to a number of changes in the CS major.

"I have seen many students return as alumni and comment that Robbie was the faculty member who had the most impact on them," says Department Chair Bruce Croft. "He is very deserving of this award."

Berger named a Lilly Fellow

The UMass Amherst Center for Teaching (CFT) named Assistant Professor Emery Berger as a Lilly Teaching Fellow for the 2006-2007 academic year. Lilly Fellows are selected on the basis of their promise in teaching and research, their interest in undergraduate teaching and in developing innovative teaching skills, and their potential for making a positive impact on the teaching culture in their department, college, and broader campus community.

For his Lilly project, Berger will develop a new sophomore-level computer science course entitled *Principles of System Design*. This course will integrate the various areas of computer systems and focus specifically on the cross-cutting concepts and principles that underpin their design. "Teaching these principles will provide students with the conceptual tools for understanding all aspects of computer systems," says Berger. "Furthermore, treating these topics in a single course will ensure that all of our students have a solid understanding of every major computer system." This broad scientific approach will enable students to understand and develop modern large-scale applications.

Berger joined UMass Amherst in 2002 as an Assistant Professor after receiving his Ph.D. from the University of Texas at Austin. Berger's research focuses on improving the performance and reliability of modern computer systems. His work spans programming languages, runtime systems, and operating systems, with a particular focus on memory management. Berger is the creator of Hoard, a widely-used scalable memory manager, and is part of a research group singled out by National Science Foundation (NSF) site visitors as the best memory management group in the country. He leads the Programming Languages and Systems at Massachusetts (PLASMA) group and is a 2004 NSF CAREER Award recipient.

Previous Lilly Teaching Fellows in the Department include Andrew McCallum (2005-2006), Brian Levine (2003-2004), Prashant Shenoy (2001-2002), James Allan (1999-2000), Ramesh Sitaraman (1996-1997), David Mix Barrington (1994-1995), Jim Kurose (1993-1994), and Eliot Moss (1991-1992).

AWARDS

Towsley *(from page 1)*

In the 1980s, Towsley developed some of the early models of distributed computer systems and parallel processing systems with a particular focus on scheduling. In the early to mid 90s, he developed a framework for analyzing the performance of reliable multicast protocols that eventually led to the recognition of the significant potential of forward error correction to improve performance. In the late 90s, Towsley greatly advanced the design, modeling, and analysis of IP networks through the use of fluid models and the application of control theory to the study of TCP. At the same time, he also developed a statistical framework for network tomography based on the use of end-to-end measurements.

An IEEE and ACM Fellow, Towsley serves as Chair of the IFIP Working Group 7.3 on Performance Modeling and Measurement, and is Editor-in-Chief of IEEE/ACM *Transactions on Networking*. He holds five patents and has published over one hundred papers in journals. He has received numerous awards, including the IEEE Communications Society William Bennett Theory Best Paper Award. Towsley obtained a B.A. in Physics from the University of Texas in Austin in 1971 and a Ph.D. in Computer Science, also from the University of Texas in Austin in 1975. He is currently the co-Director of the Computer Networks Research Group.

The IEEE Board of Directors established the IEEE Koji Kobayashi Computers and Communications Award in 1986 for outstanding contributions to the integration of computers and communications. The Award is named in honor of Dr. Koji Kobayashi, who has been a leading force in advancing the integrated use of computers and communications.

DARPA honors Lesser and former students

The Defense Advanced Research Projects Agency (DARPA) bestowed special recognition to UMass Amherst Professor Victor Lesser and his former students Alan Garvey (Ph.D. '96) and Keith Decker (Ph.D. '95) for their foundational research in generalized coordination technologies.

In May, the three researchers received commendations from DARPA's Information Processing Technology Office at the DARPA Coordinators Principal Investigators meeting in Las Vegas. They were commended for their "superior research efforts and vision [that] fostered the development of a new paradigm which enables loosely coupled distributed autonomous systems to work effectively together. The paradigm is an important technical discriminator for the Department of Defense and for the United States." This research collaboration was initially undertaken while Decker and Garvey were students advised by Lesser.

Lesser is the director of the Department's Multi-Agent Systems Lab (MAS). Decker is currently an Associate Professor of Computer and Information Sciences at the University of Delaware, and Garvey is an Associate Professor of Computer Science at Truman State University.

Croft receives IBM and Microsoft awards

IBM recently selected W. Bruce Croft, Distinguished Professor of Computer Science, for a 2006 Eclipse Innovation Faculty Award. This international award competition is designed to encourage the use of open source and open standards-based tools for academic curricula and research. Croft's project, "Incorporating Effective Search into the UIMA Framework," involves the extension of the *Lemur* toolkit and *Indri* search engine, developed at the UMass Amherst Center for Intelligent Information Retrieval (CIIR) and Carnegie Mellon University, to support IBM's Unstructured Information Management Architecture (UIMA) for interoperability between language technologies.

In another competitive program, Microsoft Live Labs chose Croft as one of 12 winners of its Accelerating Search in Academic Research request for proposals (RFP). The RFP, which generated more than 180 applications from all over the world, was issued to discover and fund academic research that will improve Internet search technologies, data mining, discovery, and analysis. Croft's project, "Discovering and Using Meta-Terms," will investigate automatic techniques for improving queries by adding more specific forms of words that have been discovered using the Web. A unique feature of this program is that it gives awardees access to extensive data logs from MSN and the ability to run large numbers of search queries to support the research.

Langford marks first year as NSM Dean

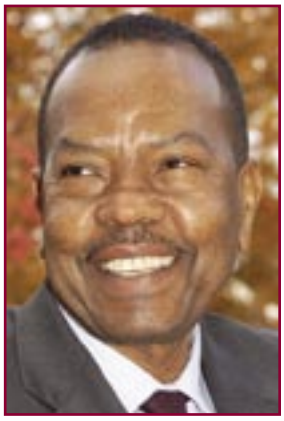


photo by Thom Kendall

September marked George M. Langford's first anniversary as Dean of the College of Natural Sciences and Mathematics (NSM). Dean Langford, who also serves as Professor of Biology, is a nationally known scientist, researcher, and teacher. He was formerly the Ernest Everett Just Professor of Natural Sciences and Professor of Biological Sciences at Dartmouth College in Hanover, New Hampshire, and an Adjunct Professor of Physiology at the Dartmouth Medical School from 1991 until 2005.

As part of his efforts to transform the College of Natural Sciences and Mathematics into a leading center of excellence on a global scale, Dean Langford has launched a Visioning Planning process in NSM to strengthen five key areas: Nanoscience and Nanotechnology; Biomedical Innovation; Energy Science and Technology; Environmental Science and Education; and Science and Mathematics Education Reform. He has appointed Computer Science Professor Lori Clarke as a member of his blue ribbon Visioning Steering Committee.

"I have every confidence in NSM's capacity for excellence, with Computer Science as one of our top-ranked departments," says Langford. "I firmly believe that with prudent investments and strategic visioning, CS will shine even more brightly."

Dean Langford is also planning a national conference, The Science and Engineering Workforce: The American Solution, to take place in fall 2007.

A cell biologist and neuroscientist, Dean Langford studies cellular mechanisms of learning and memory. The aim of his research is to better understand how the brain remembers and what makes it forget when neurodegenerative diseases such as Alzheimer's take hold.

In 1998, Dean Langford was nominated by then President Bill Clinton to the National Science Board (NSB), the governing board of the National Science Foundation, to advise the President and Congress on national science policy. He served on the NSB from 1998 to 2004, as Chair of the NSB Education and Human Resources Committee from 2002 to 2004 and as Vice-Chair for the NSB National Workforce Taskforce Subcommittee from 1999 to 2004.

Dean Langford received his Ph.D. from the Illinois Institute of Technology and completed postdoctoral training as an NIH fellow in the cell biology program at the University of Pennsylvania. He was Professor of Physiology in the School of Medicine at the University of North Carolina at Chapel Hill before joining the faculty at Dartmouth College.

Department hosts distinguished lecturers

As part of the 2006-2007 Distinguished Lecture Series, the Department selected five prominent researchers from academia and industry.

Peter A. Freeman, Assistant Director of the National Science Foundation's Directorate for Computer & Information Science (CISE) and Professor and Founding Dean of the College of Computing at Georgia Institute of Technology, gave a presentation on "The Future Internet: Can we get there from here?" During his talk, Freeman outlined the policy, legal, and technical dimensions of the challenges of the Internet and then discussed the research initiative that NSF is undertaking to address the technical dimension.

Freeman was this year's Sidney Topol Distinguished Lecturer. The Topol Series was established through the generosity of Sidney Topol, UMass Amherst class of 1947 alumnus. Topol is regarded as a telecommunications pioneer who helped forge the cable-satellite connection that triggered the growth of cable television in the United States.

In October, the Department was pleased to hear **Barbara G. Ryder,** Professor of Computer Science at Rutgers University, speak on "Helping Programmers Debug Code Using Semantic Change Impact Analysis." Ryder's current research focuses on static and dynamic program analyses for object-oriented systems in practical software tools.

During his distinguished lecture, **Thomas S. Huang,** William L. Everitt Distinguished Professor of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign, gave a talk on "Image Processing: Interconnections." In this talk, Huang gave two examples of interconnections: (1) very low bit-rate video coding using a 3D model-based approach, which combines computer vision and computer graphics; and (2) audio-visual speech recognition, which combines the audio and the visual modalities.

In November, the Department hosted distinguished lecturer **Martha E. Pollack,** Professor and Associate Chair for Computer Science & Engineering at the University of Michigan, who spoke on "Intelligent Assistive Technology: The Present and the Future." During her presentation, Pollack gave an outline for using computer science and technology to assist people suffering cognitive impairment.

In February, the Department will host **Philip A. Bernstein,** Principal Researcher in the Database Group at Microsoft Research. He will speak on "Model Management: A Schema Mapping Infrastructure for Data Integration." Bernstein's primary research is on metadata management systems in the context of his model management project. His goal is to make database systems easier to use for model-driven applications, such as design tools, message translators, and database translators.

In Memoriam
Professor Emeritus David W. Stemple (1937 - 2006)

Professor Emeritus David W. Stemple passed away at the age of 68 on March 22 after a long battle with cancer.

"David was a great colleague and good friend, and we will miss him enormously," says Department Chair Bruce Croft.

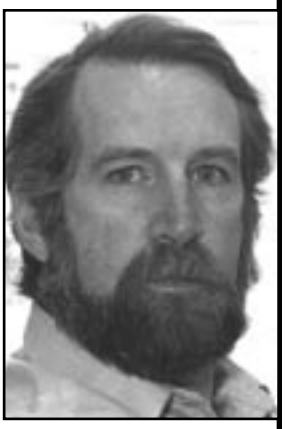
Professor Stemple served as Chair of the Department from 1994 through 1998. He was also an Honorary Professor of Computational Science at the University of St. Andrews in Scotland, and known (though anonymously) to children around the world as Pa in his wife's book, Owl Moon.

A native West Virginian, Stemple was born in Webster Springs, WV on July 31, 1937. He graduated with a B.S. in three years at West Virginia University in Morgantown, and got a Master's degree in Mathematics the following year. He taught at Wheeling College (WV) for a year, and then moved to New York City in 1960.

Starting in 1960, Stemple was involved in the development of compilers, operating systems, and database management systems in industry, first with IBM where he worked on the original Fortran compiler, and then with Computer Usage Company, a computer software consulting firm. He later moved to the Pioneer Valley and worked at UMass Amherst's Academic Computing Center.

Over the next fifteen years, he developed software and helped found a time-sharing computer company, Multicomp, based on an operating system he and others at the Computer Center developed. In 1977, Stemple earned his Ph.D. in Computer and Information Science from this Department, which he joined as an Associate Professor in 1981. He continued his research in operating systems and database systems, eventually becoming a full professor and then Chair. He was particularly noted for his work with his Ph.D. student Tim Sheard (Ph. D. '85) on using formal specification and automated proof technology for verifying properties of database systems.

Stemple also worked closely with Adjunct Professor Krithi Ramamritham, Dean of Research and Development at IIT Bombay, on the UMass Amherst-developed Gutenberg system, a port-based, object-oriented operating system kernel designed to facilitate the design and structuring of distributed systems. The Gutenberg Operating System Kernel takes a unique approach to interprocess communication, provides multiple programming language support, and attempts to minimize overheads. "We had a very productive research relationship and wrote many conference and journal articles together on our work on the Gutenberg project," says Ramamritham. "I will cherish those years for a long time to come."



One of Stemple's former students, Wei Zhao (Ph.D. '86), came to UMass Amherst 24 years ago as a new student; Zhao was also the first computer science (formerly COINS) graduate student from China. "Professor Stemple accepted me as his Master's student. He was more than an advisor; he was a mentor and a friend," says Zhao, currently Director of the National Science Foundation's Computer and Network Systems Division and Senior Associate Vice President for Research at Texas A&M University, will become Dean of RPI's School of Science in January. "David helped me to improve my English speaking ability, taught me to be a better technical writer, and challenged me to further develop my critical thinking skills. I would not have been able to grow my career without his tremendous help. I, and others whose lives he has touched, will always remember David as a great teacher and a great person."

In addition to his computer science career, Stemple was an ardent birder and became a bird song recordist, learning much from UMass Amherst Biology Professor Don Kroodsma. Stemple developed and donated a database system for field recordists to the Macaulay Museum Library of Natural Sounds at Cornell University. Since retiring in 1998, he worked recording bird songs and he did research on song repertoires and geographic variation in a number of montane thrushes from the Andes to the Alps. His recordings are in the collections of Cornell University and the British Museum.

Stemple is survived by his wife Jane Yolen, daughter Heidi E. Y. Stemple, sons Adam D. Stemple and Jason F. Stemple, six grandchildren, and three brothers. Memorial gifts may be made in Stemple's name to either the Massachusetts Audubon Society, South Great Road, Lincoln, MA 01773, or the Macaulay Library of Natural Sounds, Cornell Lab of Ornithology, 159 Sapsucker Woods Road, Ithaca, New York 14850.

Kurose and Towsley in ground-breaking consortium

Distinguished Professors Jim Kurose and Don Towsley are involved in the newly formed IBM-led International Technology Alliance (ITA) in Network and Information Sciences. The consortium, funded by the U.S. Army Research Labs and the U.K. Ministry of Defense, will undertake a research program exploring advanced technology for secure wireless and sensor networks, over a potential 10 year period, with a value of up to $135.8 million.

The ITA brings together leading U.S. and U.K. commercial and academic organizations in four interconnected areas of research: network theory; security across a system of systems; sensor information processing and delivery; and distributed coalition planning and decision making. The program will provide open collaborative research cutting across national, institutional and technical area boundaries, and, with 25 partner institutions from academia and industry, is one of the world's largest collaborative technology programs.

University of Massachusetts Amherst
Fall 2006

Alum Matters

A newsletter for alumni of the Department of Computer Science

Brodley promotes interdisciplinary research

Recently, the President's Information Technology Advisory Panel encouraged universities to promote multidisciplinary research. Professor Carla Brodley (UMass Amherst CS Ph.D. '94) has been involved in multidisciplinary research since graduating in 1994. She has developed new machine learning methods to address problems arising from a variety of applications including content-based image retrieval of medical images, remote sensing, computer security, digital libraries, astrophysics, computer vision, chemistry and pulmonary disease.

While at UMass Amherst, Brodley was advised by Professor Paul Utgoff. She joined the School of Electrical and Computer Engineering at Purdue University in 1994, earning tenure in 2000. Her research is not limited to machine learning, but includes significant contributions in other disciplines through multidisciplinary research projects.

While at Purdue, together with Prof. Avi Kak, radiologists Dr. Alex Aisen and Dr. Lynn Broderick, and several graduate students, she developed a content-based image retrieval (CBIR) system for medical images. The current methods for analyzing difficult tomography images of the lungs require physicians to page through published books of images in order to locate a match with the query image. Brodley and her colleagues developed a system in which the physician delineates the pathology bearing regions (PBR) in a query image (the patient of interest), which is then matched against a database of images, thus automating the process. The system returns the four images that are most visually similar to the query image. The physician uses the diagnostic information of the retrieved images to aid in his/her diagnosis of the query patient. Together with one of her Ph.D. students (Jennifer Dy, now an assistant professor at Northeastern), Brodley developed a retrieval method called customized queries, that through the use of unsupervised feature selection chooses the most visually similar images within the predicted disease class. The best features for defining visual similarity in HRCT images of the lung are disease specific, just as the features that best define similarities or differences among cars are different than those that define similarities or differences among aircraft. In 2001, they performed an evaluation trial with eleven radiologists/physicians to determine whether the CBIR system helps doctors interpret medical images and thereby assist in diagnosing patients. In this trial, the system doubled diagnostic accuracy of non-lung specialists. The results of this trial were published in *Radiology*.

In another project, Brodley collaborated with Geography Professor Mark Friedl from Boston University to improve automated map making. Brodley created a method for identifying mislabeled features on land-cover maps using boosting decision trees. The resulting methods have been incorporated into the MODIS (the Moderate Resolution Imaging Spectroradiometer) land-cover product. MODIS is the flagship instrument of NASA's Earth Observing System, a seven billion dollar project to study the Earth's atmosphere, oceans, and terrestrial ecosystems.

After receiving tenure in 2000, Brodley became increasingly interested in computer security; and she taught a senior undergraduate course in security from a systems perspective. She investigated whether users can be identified by their command sequences and mouse movements; and she developed methods for detecting and implementing covert timing channels in TCP/IP. Most recently in a project with Prof. T. N. Vijaykumar and three graduate students, she developed a hardware solution to prevent buffer overflows. Buffer overflow attacks are the most prevalent type of attack, comprising more than half of the advisories published annually by CERT. Brodley and her colleagues' solution, SmashGuard, prevents attacks that overwrite the return address

stored on the stack, which attempt to redirect execution to an attacker's code. This work appeared in *IEEE Transactions on Computers* in October 2006.

Dr. Brodley continues to be active within the machine learning community. She served as co-program chair for the International Conference on Machine Learning (ICML) in 2001, and in 2004, she served as the general chair of ICML. In 2004-2005, she served on the Defense Sciences Study Group, a committee sponsored by DARPA, which is designed to convey to its members an understanding of the technical dimensions of national security issues. Membership in the DSSG is highly selective and achieved through nominations of senior academics and officials from government agencies (UMass Amherst Associate Professor David Jensen was selected to be on the 2006-2007 DSSG). While serving on the DSSG, Brodley not only learned about issues relating to national security, but she also jumped from a para-trouper training tower, and ventured onto submarines, helicopters, tanks, and large ships. She also serves on the Computing Research Association's Committee on the Status of Women in Computing Research (CRA-W). The goal of CRA-W is to take positive action to increase the number of women participating in Computer Science at all levels. Currently, she serves as co-funding chair with Carla Ellis at Duke University (UMass Amherst Professor Lori Clark is a co-chair of this committee).

In the fall of 2004, Brodley joined the Department of Computer Science at Tufts University as a Professor. In addition to her wish to move back to the Boston area, she chose Tufts because of the unique environment it provides. "Tufts imparts equal importance to both education and research," says Brodley. In the 2005/2006 academic year, she became the acting chair and helped the School of Engineering to become an interdisciplinary engineering school. Perhaps the driving factor in her choice to join Tufts was the ease with which interdisciplinary research happens. Within her first year she has established collaborative research projects with the departments of Classics, Chemistry, Medicine, and Civil Engineering. She is currently working on several multidisciplinary research projects, including a project with Astrophysics at Harvard, with the Tufts Chemistry Department, and with Boston University's Medical and Dental school where the goal is to create a device that analyzes pulmonary patients' sputum to determine whether a patient is in an exacerbated disease state or has a secondary infection. This semester she is piloting a new course with Tuft's Chemistry Professor David Walt aimed at bringing together modern chemists, biologists, and computer scientists to solve computational problems in chemistry and biology. Brodley says, "My vision for the Tufts Computer Science department is to create an interdisciplinary research environment, building on the current strengths in the department to excel in all aspects of the analysis of data, including machine learning, data mining, computational biology, data bases, graphics, and visualization."

Popplestone fellow selected

Gary Huang (far right), the first recipient of the *Robin Popplestone Fellowship in Robotics & Artificial Intelligence,* poses at the CS Homecoming celebration with (l to r) Department Chair Bruce Croft, Robin Popplestone's wife Kristen Morrison, and NSM Dean George Langford. Huang joined the Department's Ph.D. program this fall after receiving an M.S. in Computer Science from Stanford University. He is working with Assistant Professor Erik Learned-Miller.

Our Ph.D. graduates: Where are they now?

The following people graduated with Ph.D.s in Computer Science from UMass Amherst within the past year:

Sherief Abdallah: "Scalable Cooperative Multiagent Reinforcement Learning in the Context of an Organization" (Victor Lesser, Advisor); Lecturer, Institute of Informatics, The British University in Dubai.

Raphen Becker: "Exploiting Structure in Decentralized Markov Decision Processes" (Victor Lesser & Shlomo Zilberstein, Advisors); Software Engineer, Google, Inc.

Weifeng Chen: "An efficient and privacy-preserving framework for information dissemination among independent entities" (James Kurose & Donald Towsley, Advisors); Assistant Professor, Department of Math & Computer Science, John Jay College.

AnYuan Guo: "Planning and Learning for Weakly-Coupled Distributed Agents" (Victor Lesser, Advisor); Self-employed: investment software developer; publicist; art dealer.

continued on page 10

Sandholm receives award at IAAI

UMass Amherst Computer Science alumnus Tuomas Sandholm (Ph. D. '96) received the American Association of Artificial Intelligence (AAAI) Deployed Application Award for his insight and achievement in applying artificial intelligence to strategic sourcing activities. The award was presented at the Eighteenth Annual Conference on Innovative Applications of Artificial Intelligence (IAAI-06) in Boston in July. Sandholm is a professor in the Computer Science Department at Carnegie Mellon University and the founder, chairman and chief scientist of CombineNet.

Sandholm has been internationally recognized for his efforts, having received several of the most selective academic awards in the field, including the prestigious Computers and Thought Award, presented by the International Joint Conference on Artificial Intelligence (IJCAI), and the Sloan Research Fellowship, presented by the Alfred P. Sloan Foundation. He has also received the National Science Foundation Career Award and the Association for Computing Machinery Autonomous Agents Research Award.

Ph.D.s *(from page 9)*

Brent Heeringa: "Improving Access to Organized Information" (Micah Adler, Advisor); Assistant Professor, Department of Computer Science, Williams College.

Matthew Hertz: "Quantifying and Improving the Performance of Garbage Collection" (Emery Berger, Advisor); Assistant Professor, Department of Computer Science, Canisius College.

Bryan Horling: "Quantitative Organizational Modeling and Design for Multi-Agent Systems" (Emery Berger, Advisor); Software Engineer, Google, Inc.

Anders Jonsson: "A Novel Approach to Abstraction Discovery in Reinforcement Learning" (Andrew G. Barto, Advisor); Department of Technologies, University of Pompeu Fabra in Barcelona, Spain.

Huan Li: "Resource Management for Distributed Real-Time Systems" (Prashant Shenoy & Krithi Ramamritham, Advisors); Associate Professor, Beihang University, China.

Xiaoyan Li: "Sentence Level Information Patterns for Novelty Detection" (W. Bruce Croft, Advisor); Visiting Assistant Professor, Department of Computer Science, Mt. Holyoke College.

Dimitri Lisin: "Image Classification with Bags of Local Features" (Erik Learned-Miller, Advisor); Post-doctoral Research Fellow, Department of Computer Science, Boston College.

Xiaotao Liu: "System Support for Pervasive Multimedia Systems" (Prashant Shenoy & Mark Corner, Advisors); Senior Research Scientist, EMC.

Ramesh Nallapati: "The Smoothed Dirichlet Distribution: Understanding Cross-entropy ranking in Information Retrieval" (James Allan, Advisor); Postdoctoral Fellow, Machine Learning Department, Carnegie Mellon University.

Jennifer Neville: "Exploiting Autocorrelation to Improve Statistical Models of Relational Data" (David Jensen, Advisor); Assistant Professor, Departments of Computer Science and Statistics, Purdue University.

Vanessa Murdock: "Aspects of Sentence Retrieval" (W. Bruce Croft, Advisor); Postdoctoral Position, Yahoo! Research.

Robert Platt, Jr.: "Generalized Robot Grasping and Manipulation " (Roderic Grupen & Andrew Fagg, Advisors); Robotics Engineer, Dexterous Robotics Lab, Johnson Space Center, NASA.

Khashayar Rohanimanesh: "Concurrent Decision Making in Markov Decision Processes" (Sridhar Mahadevan, Advisor); Postdoctoral Associate, CSAIL, Massachusetts Institute of Technology.

Frank Stolle: "Multi-image surface reconstruction from aerial images and sequences" (Allen R. Hanson, Advisor).

David J. Stracuzzi: "Scalable Learning in Many Layers" (Paul E. Utgoff, Advisor); Postdoctoral Research Scientist, CSLI, Stanford University.

Vijay Sundaram: "Self-managing Techniques for Storage Resource Management" (Prashant Shenoy, Advisor); Software Development Engineer, Microsoft.

Sudarshan Vasudevan: "Self-Organization in Large-Scale Wireless Networks" (James F. Kurose and Donald F. Towsley, Advisors); Director of Search Engine Research, Adverflex Inc.

Wei Wei: "Inference of Network Properties from Active and Passive Measurements on Wired/Wireless Networks: A Modeling Approach" (James F. Kurose and Donald F. Towsley, Advisors); Senior Research Engineer, United Technologies Research Center.

David Yates: "Scaleable Data Delivery for Networked Servers and Wireless Sensor Networks" (James F. Kurose, Advisor); Assistant Professor, Bentley College.

Chun Zhang: "On Routing Optimization in Wired and Wireless Networks" (James F. Kurose & Donald F. Towlsey, Advisors); Research Staff, IBM.

Haizheng Zhang: "Learning based organizational approach for Peer-to-Peer based Information Retrieval Systems" (Victor Lesser, Advisor); Postdoctoral Research Associate, Pennsylvania State University.

Honggang Zhang: "On the Interactions among Self-interested Users of Network Resources" (Donald Towsley, Advisor); Assistant Professor, Math and Computer Science Department, Suffolk University.

Ramping up security for 'Smart' tags

Strengthened security for "smart tags"—the wireless devices that allow drivers to zip through automatic tollbooths or pass a security desk with the flash of a card—is the aim of a new initiative that has received $1.1 million from the National Science Foundation. Led by Assistant Professor Kevin Fu, the researchers are developing much-needed cryptography protocols, hardware and applications for the increasingly common devices.

Millions of consumers already use smart tags—wireless devices that use radio waves to identify and authenticate people and things—and they will become more numerous. "Yet the privacy of the user can too easily be compromised; our research addresses that security gap," Fu says.

ECE Professor Wayne Burleson of UMass Amherst, Adam Stubblefield from The Johns Hopkins University, and security researcher Ari Juels of RSA Laboratories in Bedford, Massachusetts are collaborating on the project. The researchers' advisory team includes the San Francisco Bay Area Rapid Transit District (BART).

Smart tags—which include Radio-Frequency Identification (RFID) tags—are already used to track items from library books to merchandise to cattle. Increasingly, they are replacing the magnetic stripe cards used in security badges and mass transit cards, sometimes also serving as electronic cash. The tags will soon be incorporated into documents such as passports; their use is also being explored for tracking medical records and prison inmates.

But, according to Fu, the tags present new challenges in terms of security and privacy issues. When any system grows ad-hoc without a lot of built-in security features, it is vulnerable to attack.

RFID tags, for instance, only need to be held within a certain distance of a "reader" antenna to be read. The tags contain a digital memory chip that has a unique code, much like a bar code. When the tag passes through the electromagnetic zone of a reader antenna, the antenna activates the RFID tag and reads the encoded data, which is then decoded and passed to a host computer. The convenience of not having to physically swipe a card also means that someone with the right equipment and know-how can "read"—and steal—information from a tag that is in the back pocket of someone standing in line.

Fu and graduate student Thomas Heydt-Benjamin received considerable media exposure on their work detailing this insecurity of RFID-enabled credit cards. Their research results aired on ABC's *Good Morning America*, NBC's *Today Show*, and an article written in the *New York Times* was re-published internationally.

The new consortium, dubbed the RFID ConsortiUm for Security and Privacy (RFID-CUSP; **www.rfid-cusp.org**), takes these operating conditions into account and is designing new cryptographic definitions, algorithms, and models that will lay the solid foundation on which secure applications can be built. As part of their project, the researchers are working with the San Francisco Bay Area Rapid Transit District (BART). The project will result in the first completely open, publicly available software for experimenting with RFID security and privacy.

"Our approach is two-fold," says Fu. "We seek to make sure that the privacy of the device bearer isn't compromised. At the same time, we must prevent fraud and abuse of RFID-based systems."

Hanson and Riseman honored at Homecoming

During our annual Homecoming celebration, held on Friday, October 20, the Department honored Professor Allen Hanson and Professor Emeritus Edward Riseman with a luncheon to celebrate their contributions to UMass Amherst Computer Science and to the field of computer vision research. Many of Hanson's and Riseman's former students attended the event and spoke of their days working with the pair.

Pictured with Hanson and Riseman are their current and former Visions students and support staff. (l to r; floor level) Charles Marshall (M.S. '73), Harpreet Sawhney (Ph.D. '92), Ed Fisher (Ph.D. '76), Randy Ellis (Ph.D. '87), Edward Riseman, Arthur Provost (M.S. '74), Allen Hanson, Jerod Weinman (current student), Laurie Downey (Administrative Assistant), Paul Dickson (current student), Vidit Jain (current student), Teddy Kumar (Ph.D. '92), Claude Fennema (Ph.D. '91), Sai Ravela (Ph.D. '02), Janet Turnbull (former Business Manager); (l to r, on stairs) row 1: Moe Mattar (current student), Dimitri Lisin (Ph.D. '06), Frank Stolle (Ph.D. '06), row 2: Ralf Kohler (Ph.D. '83), Zhongfei Zhang (Ph.D. '96), Piyanuch Silapachote (current student), row 3: Paul Nagin (Ph.D. '79), Al Hough (Ph.D. '91), Adam Williams (current student), row 4: Harpal Bassali (M.S. '01), David Backer (M.S. '76).

After the luncheon, a large group of alumni and industrial partners gathered for a reception and research poster session. Faculty and students displayed over thirty posters depicting their latest research areas. There was plenty of food and spirits for the crowd as well.

Siegelmann's model reveals how jet lag disrupts the body

Hava Siegelmann

Symptoms of extreme jet lag may result from the body overshooting as it tries to adjust to particularly large leaps forward in time, suggests new research that models circadian rhythms in rats. Asssociate Professor Hava Siegelmann's analytical model appears in the current issue of the *Journal of Biological Rhythms*. Tanya Leise of Amherst College co-authored the work.

The body's sleep and wakefulness patterns are just two of the physiological processes that run on a cycle, or circadian clock, explains Siegelmann. These and other processes are coordinated by the master pacemaker, an area of the brain with a natural cycle that is approximately 24 hours long. In mammals, the master clock is a group of cells called the suprachiasmatic nucleus (SCN), which lies at the base of the hypothalamus. The SCN receives information sent from the eyes' optic nerve and can be reset by environmental cues such as light.

Recent research suggests that every cell in the body actually has its own clock—liver cells prepare for digestion at particular times of day, and patterns of hormone production and brain activity exhibit cyclic peaks and valleys, says Siegelmann. The so-called "local clocks" have natural circadian cycles that range from 21 to 26 hours, says Siegelmann. They are synchronized by the SCN, but the pathways and coordination mechanisms aren't fully understood. Evidence has recently emerged that the SCN itself is compartmentalized. One clump of cells responds to and processes information about light; this clump then in turn alerts an intermediate group of cells that transmit the information to more peripheral components.

To explore the dynamics of the system and how it responds to disruption, Siegelmann and Leise designed a model with parameters reflecting this hierarchical nature. The model accounts for the SCN's light-responsive component, its intermediate component, and the various peripheral components. It incorporates behavioral data, physiological data and known details about differences in natural circadian rhythms in the peripheral tissues. In rats, for example, internal organs such as the liver and lungs take a relatively long time to become synchronized with the SCN.

Simulations of the model revealed certain properties about both the stability and adaptability of the system. The light sensitive compartment of the master clock responds quickly, providing flexibility, whereas the intermediate compartment of the SCN seems to act as a buffer against small perturbations in the cycle. The simulations suggest that the system gets most out of whack when the master clock is shifted forward between five and eight hours. After such a large leap, the master clock actually overshoots the desired time. Then, following a slight delay, the intermediate component and some of the peripheral components overshoot as well, depending on their inherent circadian time and their connectivity with the master clock.

To transition smoothly to a different time zone, the researchers recommend advancing in chunks of not more than four hours, thus allowing the body's clocks to remain coordinated. The work also has implications for rotational shift workers, such as nurses and airline attendants, as some shifts will be much harder for the body to adjust to than others.

Undergrad "U-Space" unveiled

After a summer of renovations, the new U-Space is now available for all computer science undergraduates to use. The space in the Lederle Lowrise building is modeled after the campus library's Learning Commons.

"The new space provides a long-overdue work and study area for the CS undergraduates, and the response so far has been very positive," says Department Chair Bruce Croft.

The U-Space has a variety of work environments for undergrads including a meeting room, room with computer cubicles, and a more casual couch/table space. The Department is continuing to improve the space based on feedback from the undergraduates through their representatives.

Between classes, undergraduate students (l. to r.) Alexander Arsenault, Eric Morrison, John Shmulsky, and Caroline Cooper study in the new U-Space.

Steven Hannum, one of the undergraduate representatives, comments that the new space, including the couches and Kaosnet network access, shows that the CS Department listens to its undergraduates. "Practically anything reasonable that we have requested has been granted, and even some unreasonable requests, like couches in the CS building lobby and our own workspace," says Hannum. "Not many university administrators are so ready to go out of their way for students. It's really nice that our own Department seems to want to do so."

Intelligent systems and mobile computing awards

Many exciting new research questions in computer vision, human computer interaction, information retrieval and machine learning are emerging as cameras and global positioning system technologies become integrated with small, mobile computing devices with ever-increasing computational power and storage capabilities. Research Scientist Chris Pal and his UMass Amherst collaborators received two grants from Microsoft to explore these and other research questions.

The project called "What did we see?" focuses on images, their annotation and associated metadata obtained by people exploring natural spaces. The project is in collaboration with Jerry Schoen and Sarah Dorner with the Environmental Institute and undergraduate CS research assistant Rich Minerich. This project, funded under the Microsoft Research Digital Memories (Memex) program, is investigating how people in a community share their personal photo journals with others and the ways in which relevant information and experts in the community are identified.

Pal and his team have created a prototype system that uses geographic reference points to integrate and index Wikipedia style articles, personal Weblogs or blogs and images with more specialized location-specific information. "We are exploring the boundary of personal content in blogs and public encyclopedia style content," says Pal. "A good example of this boundary is illustrated by our community-generated wiki articles for specific locations and more specialized things of interest such as local hiking trails and interesting landmarks in towns." The project involves mathematical modeling and analysis of social networks as people share information, new ways to organize and search for information, and natural language processing. It also explores new computer vision methods for object recognition.

"What Did We See?" prototype

Piotr Parasiewicz in Natural Resources Conservation and Pal also received a Microsoft Smart Clients for eScience grant for their project "Smart Clients for Annotating the Land-Water Interface." In this project, the team is developing ways to use small Pocket PC devices to help obtain ground truth classifications of objects observed within high-resolution aerial photography. The researchers are developing client-server applications that will deal with the rapid, complex data manipulation tasks required for sophisticated, high-resolution annotations and algorithms for automating image classification. The immediate application of this technology will be in the area of ecological health through the Northeast Instream Habitat Programs river restoration projects. However, they anticipate this technology will also be highly applicable in the area of flood protection, an issue that has been front page news in recent years in Massachusetts.

Technology *(from page 2)*

This tutor adapted each slide of a Web-enabled lecture course based on its prediction about which features a student would most like to see (e.g., definition, explanation, example). The tutor examined each topic at several difficulty levels and used a Naïve Bayes Classifier algorithm to determine whether or not the topic should be taught and to manage the layout of each page.

Beyond traditional classrooms

Students are often passive in classrooms; they are not regularly involved in thinking, active learning, problem solving or argumentation. In the traditional classroom, teachers ask 95% of the questions, mostly requiring short answers. Traditional classroom methods — lectures, books, multiple-choice exams — lead to passive students and are successful only with the top 25% of students. Liberal use of interactive graphics (3D modeling and interactive character animation) and sound within intelligent tutors help teachers connect with all students.

Woolf says "We do not intend for this technology to be used to imitate conventional classroom approaches; rather we focus on challenging traditional teaching and supporting new teaching methods." Intelligent tutors play an essential role in moving education towards more student-centered methods, e.g., team collaboration, case-based inquiry and apprenticeship; techniques that are nearly impossible to implement without technology.

The Inquiry Tutor immerses a student in cases that require critical thinking. For example, the student is invited to diagnose a medical disease or predict when the next earthquake will occur (Figure 2, on page 2). A patient's complaints form an initial set of data for the medical case and the student begins the process by 'interviewing' and 'examining' the patient. Students generate hypotheses which they then defend or refute with data accessed on the Web. Each investigation (e.g., questions, hypotheses, data collection and inferences) is tracked and students must articulate how evidence and theories are related.

"As cognitive science and psychology continue to broaden our understanding of how people learn, a real possibility exists to produce a teacher for every student," says Woolf. Thus, content, teaching, assessment, student-teacher relationships and even the concept of educational institutions may all need to be rethought.

Woolf has an undergraduate degree in Physics from Smith College, received her Ph.D. in Computer Science from UMass Amherst and a second doctorate in Education. She joined the UMass Amherst Department of Computer Science in 1985 and is now Research Professor and Director of the Center for Knowledge Communication (**ccbit.cs.umass.edu/ckc**). Woolf is a Fellow of the American Association of Artificial Intelligence.

Faculty News


■ Congratulations to **Beverly Woolf** for being promoted to Research Professor and **R. Manmatha** for being promoted to Research Associate Professor.


■ Assistant Professor **Gerome Miklau** received the SIGMOD Dissertation Award for "Confidentiality and Integrity in Distributed Data Exchange." Honorable Mention for the SIGMOD dissertation competition went to Assistant Professor **Yanlei Diao**. The award recognizes excellent research by doctoral candidates in the database field. Both Miklau and Diao joined the Department in 2005.

■ Professor **Andrew Barto** gave a keynote lecture at the Sixth International Conference on Epigenetic Robotics in Paris and a distinguished lecture at the University of Alberta.

■ Adjunct Professor **Krithi Ramamritham** was appointed as the Dean of Research and Development at IIT Bombay, India. Before taking over as Dean, he completed a term as the Head of the School of Information Technology at IIT.

■ Professor **W. Richards Adrion** received a UMass Strategic Initiative Grant for his project "A Tablet PC-Based, Cooperative Learning Environment for a Multidisciplinary IT Course."

■ The Assocation for Computing Machinery (ACM) recently named **George Avrunin** as a Distinguished Member. This honor was created to recognize ACM members who have shown an extraordinary commitment to the field throughout their careers. Avrunin is a UMass Amherst Professor of Mathematics and also an adjunct professor in Computer Science. He studies analysis and verification of concurrent and distributed computer systems; requirements engineering; real-time computer systems; co-homology and representation theory of finite groups.

Free wireless Internet in downtown Amherst

Cooperating with Kris Pacunas and David Soucie from the Town of Amherst IT department, UMass Amherst CS Department Assistant Professor Mark Corner and Associate Professor Brian Levine are expanding wireless coverage in downtown Amherst, MA. This network, along with the network already installed in the Library and Town Hall, promises to support a variety of municipal services, free Internet access to citizens, and adds additional research capability to the UMass Amherst DOME project (**prisms.cs.umass.edu/dome**). Deployment of this network is underway. The researchers have purchased 11 Cisco Mesh Access Points, a Cisco Catalyst switch, and an Aironet 4400 wireless controller. Together with equipment donated by Cisco, Corner and Levine will be deploying Mesh Access Points in 18 outdoor locations in downtown Amherst. They are continuing to expand the coverage of this network, as funding permits.

■ In an article that received international press, Professor **Roderic Grupen** was quoted about how robots may provide care for the aging population.

■ Professor **Lee Osterweil** is the chair of the National Academies Panel on Strategic Planning for the Social Security Administration.

■ Intel Corporation awarded funding to Assistant Professor **Emery Berger** for his DieHard project.

■ Assistant Professor **David Kulp** received a UMass Amherst Faculty Research Grant for his project "Microarray-based resequencing of diploid DNA using maskless oligonucleotide synthesis."

■ Assistant Professor **Oliver Brock** will serve as program chair of the 2007 Robotics: Science and Systems Conference and general chair of the 2008 conference. Brock is also an editor of the book *Robotics: Science and Systems I*, published by MIT Press with co-editors Sebastian Thrun, Gaurav Sukhatme, and Stefan Schaal.

■ ACM invited Distinguished Professor **Arnold Rosenberg** to participate in their new Distinguished Lecturer program, one of the premier technology outreach programs in the computing industry. He also gave a distinguished lecture at Purdue University Computer Science Department in October. On a personal note, Rosenberg completed the Falmouth Road Race this year, and he also celebrated the birth of his third grandchild (first granddaughter) on October 11.

■ The Laboratory for Software Engineering Research (LASER), co-directed by Professors **Lori Clarke** and **Lee Osterweil**, entered into a strategic partnership with the Institute of Software at the Chinese Academy of Sciences in Beijing, China, and also the Tata Consultancy Services Research Laboratory in Hyderabad, India. Osterweil gave a keynote address to the Process Simulation Workshop in Shanghai, China in May. He was also the general chair of the 28th International Conference on Software Engineering in Shanghai, China in May, and he appeared on China Cable TV for the opening of the conference.

■ Distinguished Professor **Jim Kurose** gave a keynote address at the Embedded Networks Workshop, guest-edited a special issue of the IEEE *Journal on Selected Areas in Communication on Sampling the Internet*, and co-chaired the NSF Workshop on Integrative Computing Education and Research (ICER) for the Northeast Region. He also was appointed to the ACM Educational Council.

■ Associated Professor **Andrew McCallum** was elected to the board of the International Machine Learning Society. He also gave an invited talk at the Twelfth ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD).

■ **Stephen Constantine**, who teaches the Department's Junior Year Writing Program, received his Ph.D. in English this spring.

Researcher News

■ Upon completion of his Ph.D., **Gideon Mann** was promoted to Senior Postdoctoral Research Associate within the Information Extraction & Synthesis Laboratory.

■ **Brian Pinette** (UMass Amherst CS Ph.D. '94) joined the Visions Lab as a Senior Research Fellow.

■ Working with Assistant Professor David Kulp, **Michael Duff** (UMass Amherst CS Ph.D. '02) is a new Postdoctoral Research Associate.

■ **Majid Ghaderi** joined the Computer Networks Lab as a Senior Postdoctoral Research Associate.

Student News

■ This year's outstanding undergraduate award recipients are **Rob Hall** (Artificial Intelligence), **Russell Silva** (Security), **Michael Sindelar** (Theory), **Rick Cocci** (Networking), **Irene Ros** (Software), and **Byron Wallace** (Systems). Each of the honorees graduated in 2006 with a B.S. in Computer Science. Cocci and Hall are now in the Department's Bay State Fellowship program and Sindelar is in the Ph.D. program.

■ **Alexander Epshteyn** placed seventh in the Interactive Brokers Collegiate Trading Olympiad, garnering a $5,000 prize for both himself and a donation to the Department. Epshteyn graduated with his M.S. in September 2006.

■ Center for Intelligent Information Retrieval (CIIR) graduate student **Ben Carterette**, along with co-authors Associate Professors James Allan and Ramesh Sitaraman, received the Best Paper Award at the ACM SIGIR 2006 conference in Seattle, Washington for their paper "Minimal Test Collections for Retrieval Evaluation."

■ Undergraduate **Matt Marzilli** was selected from over a thousand applicants to receive a prestigious Barry M. Goldwater Scholarship honoring the late United States Senator from Arizona.

■ Computer Science undergraduates placed first and second at the 21st Annual Henry Jacob Annual Mathematics Competition organized by the UMass Amherst Department of Mathematics and Statistics. First prize went to **Shaohan Hu** and second to **Michael Krainin.**

■ One of the campus's Gerald F. Scanlon Student Employee of the Year Awards went to **Byron Wallace** (B.S. '06).

Olsen wins Anita Borg scholarship

Graduate student Megan Olsen is one of only 19 students awarded a $10,000 scholarship from the Anita Borg Institute for Women and Technology and Google, Inc. for the 2006-2007 academic year.

Olsen is a Ph.D. student in the Biologically Inspired Neural and Dynamical Systems (BINDS) Laboratory directed by Associate Professor Hava Siegelmann. Olsen's research focuses on cellular growth, death, mutations and tumor formation simulation and she is also interested in artificial intelligence and its potential use in biological inspired system and learning.

The Google Anita Borg Memorial Scholarship is given to undergraduate and graduate students completing their degrees in computer science or related fields. The scholarship is named for the late computer scientist who devoted much of her life to encouraging women to pursue careers in technology and computing.

■ Verizon awarded a Rising Star Fellowship to Information Extraction and Synthesis Laboratory graduate student **Pallika Kanani.**

■ CIIR graduate student **Ron Bekkerman** and his wife Anna are the proud parents of daughter Naomi, born on November 4.

Staff News

■ **Valerie Vasquez-Alexander** joined the main office administrative staff as Clerk III.

■ **Kathie Terry** joined the Computer Science Computing Facility (CSCF) as their administrative/bookkeeping support staff, Clerk IV.

■ CSCF's **Jonathon Leachman** was promoted to Associate Software Specialist 2.

■ **Emily Horrell** was promoted to Robotics Lab Manager 2.

We need your continued support

Gifts like yours help the Department in many ways, such as funding Departmental seminars by outstanding scientists, assisting undergraduate research and helping new faculty establish their research programs. In addition to contributions ear-marked for a specific purpose, general support helps make it possible for us to continue activities that enrich our educational and research programs.

As a result of your generous donations, the Department completed renovations on the new "U-Space" – rooms in the Lederle building that contain a variety of work and relaxation environments for the exclusive use our undergraduate students.

In addition to donations to the general Department funds, you can also contribute to targeted funds such as the Caxton P. Foster Memorial Fund, part of the Computer Science Endowment Fund, and the Robin Popplestone Memorial Endowment, which supports the Robin Popplestone Fellowship in Robotics and Artificial Intelligence that is awarded to an incoming graduate student each year.

Visit **www.cs.umass.edu/csinfo/donate.html** for online donations. If you would like to mail a donation directly to the Department of Computer Science, please make checks payable to "UMass Amherst Computer Science" and mail to: Jean Joyce, External Relations, UMass Amherst, Department of Computer Science, 140 Governors Drive, Amherst, MA 01003-9264. To have a postage paid donation envelope sent to you, send email to alumni@cs.umass.edu. Thank you for your support of the Department.

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GIFTS

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The following alumni and friends have actively supported the Department of Computer Science from **March 2006 through October 2006.** Such financial support is greatly appreciated and helps maintain a world-class instructional and research program. Contributions of alumni and friends help to fund important special activities that are not supported through the state budget.

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Ms. Minh T. Au 2002
Mr. Thomas C. Baker 1986
Edward & Claire Banatt
Dr. Daniel J. Barrett 1998
Ms. Barbara F. Bazemore 1982
Mr. William A. Birchenough 1994
Mr. George E. Bowker 1983
Mr. Charles W. Boyle 1994
Mr. Donald A. Bray 1986
Mrs. Mary C. Brown 1985
George and Julie BuAbbud
Mr. Daniel F. Burke 1982
Dr. Brendon D. Cahoon
Ms. Lesley A. Cederlund 1985
Mrs. Madhura S. Chacko 1980
Mr. Dansong. Chen 2002
Dr. Shenze Chen 1992
Mr. Alpin C. Chisholm 1977
Jennifer & Thomas Chistolini 1986
Chistolini Charitable Gift Fund
Mr. Richard F. Cormier 1988
Mr. Gilbert B. Daniels 1968
Mr. Charles F. Denison 2003
Dr. Jayanta Kumar Dey 1998
Mr. Andrew J. Dunne 1989
Dr. Edmund H. Durfee 1987
Lakshmi & Sastry Dwivedula
Gerardo & Adriana Esposito
Mr. Benjamin H. Fabry 1996
Dr. Claude L. Fennema, Jr. 1991
Mr. Peter Flanagan
Mr. David A. Franklin 1987
Mr. Thomas A. Galanis 1999
Jon & Kristen Glass 1985
Dr. Oscar J. Gonzalez 2001
Ms. Judith L. Greenspan 1982
Mr. David M. Hart 1990
Mr. Michael J. Hartman 1982
Mr. Robert L. Hazen 1983
Mr. Thomas P. Healy 1984
Mr. Bryan C. Horling 1998
Dr. Alfred A. Hough 1991
Mr. Haoling Huang 1997
Michael S. Hughes 1988
Mr. Scott A. Janousek 1996
Mr. Rajesh K. Jha 1990
Mr. Yufeng Jing 1994
Mr. Tareef Kawaf 1994
Mrs. Colleen B. Kettle 1984
Mr. Bruce B. Lacey 1985
Mr. Lawrence M. Lanzilli, Jr. 2001
Mr. Peter G. Lazar 2003
Mr. David J. Lee 1981
Mr. Ben C. Leung 1993
Dr. Steven P. Levitan 1984
Ms. Jie Lin 2001
Mr. George A. Logemann 1992
Mrs. Woen-Ru L. Ma 1981
Mr. Saul R. Marcus 1977
Andrew & Karin Merlino 1986
Mr. Michael C. Monks 1987
Ms. Michelle L. Moutinho 1986
Roger & Dorothy Myers
John & Laura Nalesnik
Mr. Joseph R. Neslusan 1992
Dr. Jitendra D. Padhye 2000
Mr. Charles N. Paliocha 1983
Dr. Achilleas Papakostas 1993
Dr. Ron Papka 1999
Mr. Ricakrd A Parker 1981
Prof. Doina Precup 2000
Mr. Thomas M. Reilly 1986
Mr. Robert J. Richard 1990
Mrs. Constance A. Rodriguez 1997
Mr. Gilbert D. Ross Jr. 1982
Ms. Alyssa B. Rulf-Fountain 1992
Dr. Henning Schulzrinne 1992
Mr. Michael J. Scudder 1990
Mrs. Becky Renee Shelton 1981
Mr. Stephen P. Shmulsky
Ms. Louise M. Sironi
Mr. Daniel W. Slowik 2000
Mr. William H. Stevens III
Mr. Alan T. Sullivan 1987
Mr. Michael J. Sullivan 1971
Amy & Keith Swan 1989
Mr. Matthew R. Van Laethem 2003
Mr. John M. Vervaert 1973
Mr. Timothy J. Volpe 2001
Mrs. Nancy W. Wasiuk 1979
Prof. Charles C. Weems, Jr. 1984
Mr. Timothy M. Wright 1986
Ms. Bin Yang 1999
Dr. David J. Yates
Dr. Zhongfei Zhang 1996
Mr. Donald J. Zorn Jr. 1981

Popplestone Fellowship
Mr. Nick Sophinos 1999
Ms. Jane Yolen Stemple

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