

## **Fuzzy Judgment Aggregation Model for Neutral and Abstentious Judgments**

**Ayesha Syed**

Lahore School of Economics, Faculty of Economics, Pakistan  
*ayeshasyed@lahoreschool.edu.pk*

Judgment aggregation deals with the issue of making collective decision concerning truth-values of multiple issues. Each agent sets out its judgment in form of true or false about truthfulness of a clause. However Gardenfors (2006) stated that it is not possible in real life situations to always get the judgment sets that are complete. Research has shown that at numerous times judgment aggregation face the problem of incomplete judgment set. This situation arises when among the panel of judges; one or more judges refrain from giving an opinion on a proposition. This paper allowed judges to either give their opinion in form of a degree of membership between the range  $[0, 1]$ , additional to this judges can either stay neutral [N] or they can abstain [A] from giving an opinion.

This paper uses Dietrich's (2007) model of judgment aggregation in general logic and derive from Beg and Butt (2012) a model based on fuzzy logic in judgment aggregation. The theory of fuzzy logic is filled with several aggregation operators known as triangular norms and their implications, using Lukasiewicz and minimum t-norm this study establishes solution. Miller and Osherson (2009) Hamming distance approach to calculate missing values of a judgment set, we have developed a new methodology in incomplete set to cater the space of neutral and abstentious judgments. Minimum distance from majority solved the problem faced in crisp logic.

This study enforces the confirmation of results we get through fuzzy logic. The distance achieved with fuzzy set theory is less than that of crisp logic. Hence it's a better approach to incorporate in decision making process. This method could be an integral part of better public policy and social welfare decisions, where a decision before becoming part of society goes through several readings, and judges are presented with detailed clauses to vote.

*Keywords:* judgment aggregation, fuzzy, incomplete sets

### *References:*

- Arrow, K. J. (1963). *Social Choice and Individual Values*: Yale University Press
- Beg, I., Ashraf, S. (2008). Fuzzy similarity and measure of similarity with Lukasiewicz implicator. *New Mathematics and Natural Computation*, 4(02):191-206.
- Beg, I., Butt, N. (2012). Belief merging and judgment aggregation in fuzzy setting. *Advances Fuzzy System*, 5.
- Benamara, F., Kaci, S., Pigozzi, G. (2010). Individual opinions-based judgment aggregation procedures. *Modeling Decisions for Artificial Intelligence*. Springer Berlin Heidelberg, 55-66.
- Condorcet (M.J.A.N de Condorcet). (1785). *Essa aur l'application de l'analyse a la probabillite des decisions rendues a la pluralite des viox* (Imprimeric Royale,Paris); facsimile published in 1972 by Chalsea Publishing company, NewYork.
- Dietrich, F. (2007). Judgment aggregation in general logics. *Social Choice and Welfare*, 28(4): 529-565.
- Dokow, E., Holzman, R. (2010). Aggregation of binary evaluations, *Journal of Economic Theory*, 145: 495-511.
- Fishburn, P. C., Rubinstein, A. (1986). Aggregation of equivalence relations. *Journal of Classification*, 3(1): 61-65.

- Gärdenfors, P. (2006). A representation theorem for voting with logical consequences. *Economics and Philosophy*, 22 (2):181-190.
- Kornhauser, L., Sager, L. (1986). Unpacking the court. *Yale Law Journal*, 96: 82-117.
- List, C., Polak, B. (2010). Introduction to judgment aggregation. *Journal of Economic Theory*, 145:441–466.
- Miller, M. (2008). Judgment aggregation and subjective decision-making. *Economics and Philosophy*, 24:205–231.