

SISY 2025

IEEE 23rd International Symposium on Intelligent Systems and Informatics



Subotica, Serbia

September 25-27, 2025

## PLENARY TALK

# “Fuzzy Sets”, 60 Years Later

**Bernard De Baets**

KERMIT, Department of Data Analysis and Mathematical Modelling  
Ghent University, Coupure links 653, 9000 Gent, Belgium

**Abstract:** The theory of fuzzy sets, nearing its sixtieth anniversary, faces a challenging landscape marked by a proliferation of generalizations lacking semantic clarity and robust elicitation procedures. Similarly, numerous variants of fuzzy decision-making methods populate the literature, often characterized by ad hoc choices and unproven claims of enhanced decision-making capabilities. These developments not only fail to advance the field but also risk tarnishing its reputation in domains such as machine learning and operations research. Amidst these challenges, it is crucial to revisit foundational contributions that have stood the test of time. The compositional rule of inference and the extension principle introduced by Lotfi Zadeh in the seventies offer enduring insights, albeit often overlooked in contemporary discourse. Additionally, Goguen’s early recognition of lattice theory as the appropriate framework for fuzzy set theory remains as relevant today as ever. Drawing from these foundational principles, this keynote presentation explores pivotal milestones in fuzzy set theory, including fuzzy relational equations, computation with fuzzy quantities, and convolution lattices. These concepts not only address the propagation of non-stochastic uncertainty but also provide a lens through which to critically assess recent developments in the field. By reexamining these fundamental concepts and their applications, we can navigate the complexities of modern fuzzy set theory with renewed clarity and purpose. This journey not only enriches our understanding of uncertainty modeling but also opens new avenues for innovation in fields reliant on fuzzy logic.



**Bio:** Bernard De Baets (BDB) is a senior full professor in applied mathematics at the Faculty of Bioscience Engineering of Ghent University (Belgium), where he is leading the research unit KERMIT. Bernard has been an *affiliated professor* at the Anton de Kom Universiteit (Suriname). He is an *Honorary Professor* of Budapest Tech (Hungary), a *Doctor Honoris Causa* of the University of Turku (Finland), a *Professor Invitado* of the Universidad Central “Marta Abreu” de las Villas (Cuba), a *Professor Extraordinarius* of the University of South Africa and an Honorary Chair Professor at Bennett University and Sai University (India). As a trained mathematician, computer scientist and knowledge engineer, Bernard has developed a passion for multi- and interdisciplinary research. Over the past 25 years, more than 100 PhD students have graduated under his supervision. He is also a prolific writer, with a bibliography comprising close to 700 peer-reviewed journal papers, accumulating more than 36000 Google Scholar citations (h-index 91). Several of his works have been bestowed with a best paper award. Moreover, he is a much-invited speaker, having delivered over 300 lectures worldwide. Bernard actively serves the research community, in particular as *co-editor-in-chief* of Fuzzy Sets and Systems. He was nominated for the *Ghent University Prometheus Award for Research*. He is a *Fellow of IFSA*, received the *EUSFLAT Scientific Excellence Award* and was proclaimed *Honorary Member* of the EUSFLAT Society.