




Introduction to Special Issue: New Trends in Fuzzy Set Theory and Related Items

Humberto Bustince ¹ , Javier Fernandez ¹  and Esteban Induráin ^{2,*} 

¹ Institute of Smart Cities (ISC), Departamento de Estadística, Matemáticas e Informática, Universidad Pública de Navarra, 31006 Pamplona, Spain; bustince@unavarra.es (H.B.); fcojavier.fernandez@unavarra.es (J.F.)

² Institute for Advanced Materials (InaMat), Departamento de Estadística, Matemáticas e Informática, Universidad Pública de Navarra, 31006 Pamplona, Spain

* Correspondence: steiner@unavarra.es; Tel.: +34-948-169-551

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Abstract: We focus on the articles recently published in the special issue of Axioms devoted to “New Trends in Fuzzy Set Theory and Related Items”.

Keywords: fuzzy set theory and its applications

Since the launch, in 1965, of the key notion of a fuzzy subset by Lotfi A. Zadeh (see [1]), this concept has succeeded in growing interest and development. Nowadays, it is undoubtedly one of the most powerful and appealing branches of mathematics. Its range of applications is wide and multidisciplinary, starting from computer sciences and artificial intelligence, but also touching on a vast set of scientific disciplines (physics, engineering, medicine, economics, social choice, etc.).

Bearing in mind this fact, we accepted the task of organizing an special issue for the journal, Axioms, to collect and introduce new ideas and trends based on the notion of a fuzzy set. To do so, we suggested possible authors, working in different settings and covering an exhaustive set of possible applications.

Incidentally, as this special issue was starting to become a reality, we received a really sad piece of news: Prof. Lotfi A. Zadeh passed away in September 2017, aged 96. Therefore, this special issue was also, in a way, a homage and tribute to the person who had the clever idea of launching the important concept of a fuzzy set. All of us are scientific heirs of him.

Concerning this special issue, twelve papers have been accepted and published. Five of them come from Spain. Two of them come from Italy. One manuscript has coauthors both from Spain and Venezuela. Other papers come from South Korea, U.S.A., Poland and Pakistan (one from each of these countries).

The topics covered, of course all of them related to fuzzy sets theory and its applications, were quite different from one another. Namely, we received contributions regarding the following items:

1. Scoring and decision-making using linguistic expressions, and suitable orderings (paper by M.J. Campión et al.).
2. Theoretical and practical studies on orderings defined with type-2 fuzzy numbers and their applications in decision-making in models of inference processes where uncertainty, imprecision or vagueness is present (paper by P. Hernández et al.).
3. Aggregation functions and several kinds of operators acting on fuzzy sets, studied from an algebraic point of view (paper by L. Legarreta et al.).
4. Numerical representability of fuzzy binary relations and preferences (paper by P. Bevilacqua et al.).
5. The relationship between indistinguishability operators, introduced with the aim of fuzzifying the crisp notion of equivalence relations, and fuzzy metrics. (paper by J.J. Miñana and O. Valero).

6. Analysis of environmental evaluation practices in a context of multi-criteria decision-making, through managing interacting criteria based on Choquet integrals (paper by T. González-Arteaga et al.).
7. Studies on interval-valued intuitionistic fuzzy sets with applications to different kinds of algebra (paper by Y.B. Jun et al.).
8. Category theory and foundations of Mathematics, where, instead of the basic category of sets, a similar category of fuzzy sets is considered (paper by C. Servin et al.).
9. Studies on ordered fuzzy numbers with a revision of Kosiński's theory (paper by K. Piasecki).
10. Interplay between aggregation functions and aggregation operators, providing a link to social choice theory based on the Arrow's impossibility theorem, using functional equations and presenting some interpretation of the fuzzy framework (paper by J.C. Candeal).
11. Fuzzy graph theory: studying graphs in an intuitionistic fuzzy soft environment to be used then in developing algorithms to deal with some decision-making problems (paper by S. Shahzadi and M. Akram).
12. An study on quantiles in abstract convex structures through a new quantitative framework that generalizes previous ones for the analysis and handling of aggregation operators (paper by M. Cardin).

We want to thank all the authors of these works, which provide a wide view of some of the most recent topics in the field of fuzzy set theory. Also, we acknowledge with thanks the work done by the reviewers who collaborated to make this special issue possible. Our gratitude goes also to the editors of Axioms for the support and help with the preparation of this special issue.

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Reference

1. Zadeh, L.A. Fuzzy Sets. *Inf. Control* **1965**, *8*, 338–353. [[CrossRef](#)]



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