

SS10: Aggregation functions: Theory and practice

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Aggregation theory is a field in rapid progress. Apart from their obvious interest from a theoretical point of view, they are an essential tool for applications in many different fields, such as image processing, classification, machine learning or decision making among many other, all of them of great relevance for the Joint 17th World Congress of International Fuzzy Systems Association and 9th International Conference on Soft Computing and Intelligent Systems. For this reason, in recent years there is a growing interest in the topic, which are leading to the introduction of novel concepts and approaches.

This special session intends to provide a global view on the aggregation functions, both from a theoretical and an applied point of view. In particular, it will focus on recent theoretical developments in the fields of aggregation functions, and aims at bringing together leading researchers in the field in order to present their most recent developments and for discussing recent trends in this area, as well as to identify potential problems of interest for researchers. It will also deal with applications where aggregation functions play a crucial role and, finally, it will consider generalizations of the notion of aggregation functions which have appeared in the literature in recent years and which lead to new classes of functions that encompass both classical aggregation functions and other functions which are relevant, specially from the point of view of the applications, but which do not fulfil all the conditions required to an aggregation, as that of monotonicity.

In this sense the work by Perez-Fernandez and De Baets deals with the problem of fully understanding betweenness relations in order to appropriate fuse data and the link between these properties and penalty functions, so that the latter are defined beyond the confinement of closed intervals. Also the work by Petrik deals with the theoretical aspects of aggregation functions, providing a counterexample showing that the set of the solutions of the generalized Mulholland inequality is not closed with respect to compositions and that the dominance relation is not transitive on the set of nilpotent triangular norms. And, to finish with the works which are more oriented towards theory, the work by Honda and James analyzes some properties of the inclusion-exclusion integrals, and investigates the conditions on the interaction operator which ensure the integral is averaging.

Besides, the work by De Miguel, Sesma-Sara, Fernandez, Lopez-Molina, Bustince and Asiain combines theory and practice since it considers the extension to the interval-valued setting of the well-known fuzzy notion of equality index. This extension is done making use of appropriate aggregation functions and considering admissible orders (i.e., linear orders which extend the usual partial order between intervals).

Besides, the paper by Galski, Torres, Becceneri, Sandri, Freitas and Santana considers the OWA filters in SAR imagery, using genetic algorithms to optimize two quality indexes so that the best weighting vectors can be obtained. In the same way, the work by Castilblanco, Gomez, Montero and Rodriguez makes a study on how aggregation functions can be used in order to evaluate classifications.

Finally, the paper by Dimuro, Bustince, Fernandez, Mesiar and Bedregal deals with the recently introduced generalization of aggregation function known as pre-aggregation function, and specifically analyzes the concept of pre t-norm, i.e, a function which satisfies the same boundary conditions as a t-norm but which is only directionally monotone. These functions seem rather promising in fields such as classification.

These works provide a general view of the many different aspects where the theory of aggregation functions and that of fuzzy sets interact, since, nowadays, fuzzy theory can not be understood without aggregation functions and their extensions. We hope this session will be of interest for a wide audience and we look forward at meeting you at IFSA-SCIS 2017.