

SS01: Fuzzy Optimization and Decision Making: Theory, Algorithms, and Applications

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- The *Fuzzy Optimization and Decision Making: Theory, Algorithms, and Applications Special Session SS-01-1* concerns itself with decision making in the presence of fuzzy, possibilistic, and generalized uncertainty. Presentations include theoretical, applied, and algorithmic results.
- Clearly, decision making under fuzzy, possibilistic, and generalized uncertainty impacts many aspects of the problems that are of interest to most participants of the Joint 17th World Congress of International Fuzzy Systems Association and 9th International Conference on Soft Computing and Intelligent Systems. Whether deciding where and how a robotic arm should go to pick up an item to minimize energy (or time), or the best radiation treatment plan in the presence of incomplete information, or the optimal search strategy for finding water on Mars, or how to use constrained resources in the best way, decision making is a part of many (most) issues that are of concern to all of us.
- There are nine talks scheduled for our two sessions, five on the morning of Thursday, June 29 and four in the afternoon session. Our sessions cover the following topics.
 - There are two Analytic Hierarchical Processes under interval uncertainty. The speakers will look at how to represent the interval Hierarchical Process in such a way that one can meaningfully compute results? Secondly, how to represent vagueness in human judgment for interval weight estimates that arises in the Analytical Hierarchical Process?
 - There are two more purely theoretical results that are being presented. The first is how to characterize closed sets in the context of fuzzy set theory. Closed sets are the precursor to compact sets which in turn are crucial to optimization. The second theoretical result deals with grey numbers, properties and algebra.
 - Fuzzy type-2 optimization is the theme of one of the talks. The author will articulate how type-2 fuzzy numbers are used in fuzzy decision making.
 - There is a talk on similarity measures which is of interest to decision makers in the context of measures. However, this talk will focus more on how to use similarity in image process. Clearly, similarity is of importance to decision making in that often the decision is how close/similar entity A is to entity B.

- There are three talks dealing with heuristic methods associated with decision making. One is more theoretical, one is algorithmic, and one is an application. The more theoretical presentation introduces participatory search. The algorithm talk will present practical swarm optimization and its hybridization with the firefly algorithm. The application paper deals with the incorporation the particle swarm method in cognitive processes.
- Bi-level decision making is the topic of one presentation where it will be solved using a linear programming approach.

We trust that this special session will peak the interests of the conference participants.