## Preface

# Decision making using intelligent and fuzzy techniques

Fuzzy decision-making is the cognitive process of selecting a course of action from multiple alternatives under vagueness and impreciseness. Fuzzy set approaches to decision-making are usually most appropriate when human evaluations and the modeling of human knowledge are needed. This special issue covers several theoretical and practical representations of decision-making on the usage of intelligent and fuzzy techniques. The issue covers theoretical and practical papers on the usage of intelligent techniques based on the recent extensions of ordinary fuzzy sets such as picture fuzzy sets, intuitionistic fuzzy sets, q-rung orthopair fuzzy sets, spherical fuzzy sets, and Pythagorean fuzzy sets. The papers are the substantially extended versions of the papers selected from 250 contributions presented at the International INFUS Conference on intelligent and fuzzy systems, organized by Istanbul Technical University held at Istanbul, Turkey, in July 23–25, 2019.

In this issue, spherical fuzzy AHP, fuzzy clustering, hesitant fuzzy linguistic MCDM, fuzzy EDAS, fuzzy TODIM, fuzzy MODM, Pythagorean fuzzy WASPAS, machine learning, hesitant fuzzy linguistic TOPSIS, fuzzy aggregation operators, neutrosophic FMEA, intuitionistic fuzzy control charts, fuzzy cognitive maps, humanoid robots, neural networks, fuzzy AHP and ANP, neutrosophic DEMATEL, Z-fuzzy AHP, Pythagorean fuzzy AHP, and type-2 fuzzy AHP are among the topics handled in the accepted papers. Each paper includes an original and innovative approach using an extension of fuzzy sets or an intelligent technique. The issue represents the latest state that the intelligent and fuzzy techniques have reached in the literature.

I hope that this special issue will serve as a useful source of ideas, techniques, and methods for present and further research in the theory and practice of fuzzy set extensions. I am grateful to the referees whose valuable and highly appreciated works contributed to the selection of the high quality papers published in this special issue. My sincere thanks go to Prof. Reza Langari, the editor-in-chief, who was highly instrumental in bringing this project to its fruitful completion.

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