

Editorial Message: Special Issue on Efficient Fuzzy Systems for Mining Large Scale, Imprecise, Uncertain and Vague Data

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Pervasive sensor networks, ubiquitously available cloud computing and IoT devices generate huge temporal amounts of data. Wikipedia indicates that 2.5 exabytes of “big data” were generated daily in 2012, and that there will be 163 zettabytes of data by 2025. Analyzing big data is essential in order to extract more accurate knowledge for human needs. However, big data features high volume and high dimensionality, accumulates at fast-speed and is captured from multiple sources. On the other hand, such big data is potentially affected by fuzziness which is caused by granularity of information in generalization tasks, influence of human subjective judgments, information that is only partially available, miss-recording or inaccurate measurements, and inconsistent human evaluation over time as well as other related uncertain issues including sudden changes in human and environmental behaviors.

There is no doubt that the state-of-the-art fuzzy methods are powerful enough to deal with knowledge from fuzzy data. However, they show their limits on fuzzy big data with large volume, high dimensions, or from multi-sources. In addition, human-like decision-making with fuzziness concepts has only been employed in small-scale problems, while state-of-the-art fuzzy methods have not been widely explored in big data streams. Efficient fuzzy methodologies and technologies have to be redeveloped or reformulated from the state-of-the-art ones, in order to analyze and handle the contaminated big data streams. Besides, powerful fuzzy decision models are necessary to cope with higher dimensions and larger fuzzy rule sets, since very high-dimensional data are required to be effectively managed in big data scenarios and applications.

This special issue aims to provide innovative fuzzy system-based solutions for understanding and analyzing big data under imprecise, uncertain and vague conditions and their real-world intensive data-driven applications. The papers included in this special issue provide a specific cutting-edge collection of recent research which focuses on development of novel fuzzy system-based solutions for big data analysis. After publicly distributing the Call For Papers for this special issue from November 2015 to July 2017, and promoting it through two special sessions, namely “Bringing Big Data to its Knees: Advances in Storing, Mining and Visualising Big Bio-medical Data in the Post-genomic Era” in the Annual International Conference of IEEE Engineering in Medicine and Biology Society, 2016, and “Better Artificial Intelligence Methods for Bigger Data Mining” in the IEEE International Conference on Systems, Man and Cybernetics, 2016, we have selected 14 papers for this special issue.

This special issue includes the following papers: “A constrained fuzzy knowledge based system for the

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management of container yard operations,” “Addressing missing data and data competitiveness issues: transforming tacit knowledge into explicit form by fuzzy inference learning system,” “A novel TODIM method based three-way decision model for medical treatment selection,” “An improved method for combining conflicting evidences based on the similarity measure and belief function entropy,” “Contractor selection for construction projects using consensus tools and big data,” “Diagnosing the ADHD using a mixture of expert fuzzy models,” “Dual tree complex wavelet transform based features for automated alcoholism identification,” “Electronic nose based odor classification using genetic algorithm and fuzzy support vector machine,” “Evidential supplier selection based on DEMATEL and game theory,” “Fuzzy approach topic modeling for health and medical corpora,” “HSEE improvement in energy sector using an integrated fuzzy cognitive map-bayesian network model: large data set

analysis,” “State-of-the-art ontology annotation for personalised teaching and learning and prospects for smart learning recommender based on multiple intelligence and fuzzy ontology,” “Targets of unequal importance using the concept of stratification in a big data environment,” and “Use of nonlinear features for automated characterization of suspicious ovarian tumors using ultrasound images in fuzzy forest framework.”

We would first like to thank the authors for submitting their valuable research outcomes to this special issue, and the reviewers for their efforts in evaluating these papers. We would also like to thank Prof. Shun-Feng Su, the Editor-in-chief in the International Journal of Fuzzy Systems, for providing us the opportunity to edit this special issue and for his guidance throughout the edition process. We sincerely hope that readers will find this special issue useful.