*Fundamenta Informaticae 115 (2012) i-ii*
*DOI 10.3233/FI-2012-645*
*IOS Press*



# Rough Sets and Knowledge Technology (RSKT 2010)

## Preface

This special issue of Fundamenta Informaticae (FI) contains a selection of papers presented initially at the 5th International Conference on Rough Sets and Knowledge Technology (RSKT 2010) held in Beijing, China, October 15-17, 2010. RSKT is an international scientific conferences series that had been held successfully over last five years. The conferences are devoted to an integration of rough sets and knowledge technology, with an emphasis on both theoretical foundations and real-world applications. The eight papers included in this issue are substantially extended versions of conference papers. They cover various aspects of decision- theoretic rough sets (DTRS), fuzzy rough sets, attribute reduction and granular computing. Each paper went through at least two rounds of review. We thank all authors for submitting their best results and reviewers, Davide Ciucci, Zou Li, Duoqian Miao, Jusheng Mi, Victor Marek, Keyun Qin, Ernestina Menasalvas Ruiz, Dominik Slezak, Hiroshi Sakai, Jaroslaw Stepaniuk, Zbigniew Suraj, Wei-Zhi Wu, JingTao Yao and Bonikowski Zbigniew, for their careful, insightful and constructive reviews.

The first paper, "Autonomous Knowledge-oriented Clustering Using Decision-Theoretic Rough Set Theory" by Hong Yu, Shuangshuang Chu and Dachun Yang, proposes an autonomous clustering method using the decision-theoretic rough set model based on a knowledge-oriented clustering framework. In order to get the initial knowledge-oriented clustering, the threshold values are produced autonomously based on semantics of clustering without human intervention. The risk of a clustering scheme based on the decision-theoretic rough set is studied by considering various loss functions.

The second paper, "Modelling Multi-agent Three-way Decisions with Decision-Theoretic Rough Sets" by Xiaoping Yang and JingTao Yao, proposes a multiagent DTRS model and expresses it in the form of three-way decisions. The new model seeks for synthesized or consensus decisions when there are multiple decision preferences and criteria adopted by different agents. Various multi-agent DTRS models can be derived according to the conservative, aggressive and majority viewpoints based on the positive, negative and boundary regions made by each agent. These multi-agent decision regions are explained in terms of three-way decisions.

The third paper, "A Multiple-category Classification Approach with Decision-Theoretic Rough Sets" by Dun Liu, Tianrui Li and Huaxiong Li, proposes a new two-stage approach to solve the multiple-category classification problems with DTRS by considering the levels of tolerance for errors and the cost of actions in a real decision procedure. The first stage is to change an m-category classification problem $(m > 2)$ into m two-category classification problems, and to construct three types of decision regions: positive region, boundary region and negative region with respect to different states and actions by using DTRS. The second stage is to choose the best candidate classification in the positive region according to the minimum probability error criterion by using a Bayesian discriminant analysis approach.

The fourth paper, “Soft Minimum-Enclosing-Ball Based Robust Fuzzy Rough Sets” by Shuang An, Qinghua Hu, Daren Yu and Jinfu Liu, presents a robust fuzzy rough set model based on soft minimum enclosing ball, and introduces a new fuzzy dependency function. Simulation experiments are used to test the effectiveness of the proposed model, and the experimental results show that the soft minimum enclosing ball-based fuzzy rough set model is robust and is insensitive to noise.

The fifth paper, “Knowledge Reduction in Random Incomplete Decision Tables via Evidence Theory” by Wei-Zhi Wu, studies knowledge reduction in random incomplete information tables and random incomplete decision tables by using a hybrid model based on rough set theory and Dempster-Shafer theory of evidence. The concepts of random belief reducts and random plausibility reducts in random incomplete information tables and random incomplete decision tables are introduced. The relationships among lower approximation reducts, upper approximation reducts, random belief reducts, random plausibility reducts, and the classical reducts in random incomplete decision tables are examined.

The sixth paper, “Attribute Reduction Using Extension of Covering Approximation Spaces” by Guoyin Wang and Jun Hu, introduces the concept of the complement of a covering and an associated covering approximation space. A heuristic reduction algorithm is developed to eliminate some coverings in a covering decision system without decreasing the classification ability of the system for decision. Theoretical analysis and experimental results indicate that this algorithm can produce smaller reducts than other algorithms.

The seventh paper, “Correlating Fuzzy and Rough Clustering” by Manish Joshi, Pawan Lingras and C. Raghavendra Rao, provides an experimental evaluation of how rough clustering results can be correlated with fuzzy clustering results. It provides procedure for mapping fuzzy membership clustering to rough clustering. However, such a conversion is not always necessary, especially if only lower and upper approximations are needed. Experiment results show that descriptive fuzzy clustering may not always (particularly for high dimensional objects) produce results that are as accurate as direct application of rough clustering.

The last paper, “Set-theoretic Approaches to Granular Computing” by Yiyu Yao, Nan Zhang, Duoqian Miao and Feifei Xu, proposes a framework for studying set-theoretic approaches to granular computing. A granule is a subset of a universal set, a granular structure is a family of subsets of the universal set, and relationship between granules is given by the standard set- inclusion relation. A number of studies, including rough set analysis, formal concept analysis and knowledge spaces, adopt specific models of granular structures. The proposed framework provides a common ground for unifying these studies. The notion of approximations is examined based on granular structures.

We are especially thankful to Professor Damian Niwinski, Editor-in-Chief of Fundamenta Informaticae, for accepting this special issue and for his help throughout the publication process.

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