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Rough Sets, Rule-Based Approaches, and Knowledge Representation

Preface

This volume comprises papers presented at the Sixth Rough Set Theory Workshop (RST'2015), which was held on 29 June 2015 at the University of Warsaw. In the last few decades we have been witnessing a rapid development of rough set theory, and considerable evolution of views on its foundations. The RST meetings were initiated in Milan (2009) as a venue where this kind of rough set evolution would be deeply discussed, leading towards strengthening theoretical background for newly developed applications.

Although the first editions were stand-alone events, currently the RST workshops usually take place at (or are connected to) some leading conferences related to data analysis, intelligent systems and soft computing, so as to allow the flow of knowledge and mutual support between scientists working on *theory* and *practice* of rough sets and other methodologies. RST'2015 – following this strategy – was organized in conjunction (as an associated event) with the Sixth International Conference on Pattern Recognition and Machine Intelligence (PReMI'2015) held at the Warsaw University of Technology on 30 June – 3 July 2015.

Due to the emphasis upon a *meeting* rather than a formal conference as the main characteristic of the RST series, the authors were allowed to submit full papers or extended abstracts. This submission policy has always meant to foster inspiring discussions among researchers by allowing them to present their very last results and current projects under development. Then the authors of best presentations were invited to submit their fully developed papers.

RST'2015 comprised the special track on *Foundations of Rule-based Approaches and Relationship with Rough Sets*. Its aim was to discuss the role of rough sets in a context of different methodologies of rule representation, extraction and deployment. Thus, besides collecting paper and abstract submissions, we invited two preeminent keynote speakers, Jan Rauch and Mikhail Moshkov (whose lecture was co-authored with Beata Zielosko) to present the association rules framework based on the GUHA method and the computational complexity characteristics of decision rule systems, respectively.

Furthermore, as the core of the RST series has always been the foundations, we were very happy and proud to organize two more keynote talks, by Mihir Chakraborty who questioned the most fundamental concepts of rough set theory from philosophical and mathematical perspectives, and by Pradipta Maji who elaborated on the theoretical background and applications of various approaches to fuzzy-rough clustering.

The two above components of the scope of RST'2015 are reflected in the structure of this volume. Its first part covers different, both *rough-set* and *non-rough-set* methodologies referring to association rules and decision rules. This part includes six articles by: Jan Rauch; Agnieszka Nowak-Brzezińska; Jerzy Stefanowski and Krystyna Napierała; Marzena Kryszkiewicz; Beata Zielosko; Maciej Kopczyński, Tomasz Grześ, and Jarosław Stepaniuk.

The second part is devoted to theoretical aspects of rough sets, with an emphasis on knowledge discovery and knowledge representation. This part includes seven articles by: Mihir Chakraborty; Pradipta Maji; Marcin Wolski and Anna Gomolińska; Anuj Kumar More and Mohua Banerjee; Ivo Düntsch, Ewa Orłowska, and Hui Wang; Gianpiero Chiaselotti, Davide Ciucci, Tommaso Gentile, and Federico Infusino; and Krzysztof Pancerz.

We hope that this combination of contributions demonstrates that rough set theory continues to be a very interesting, multifaceted, and fruitful conceptual framework for new data and knowledge related technologies, in both theoretical and practical aspects.

It is a pleasure to acknowledge people who helped this issue to come into being. We would like to thank all the authors, both those whose papers were accepted and those whose papers did not appear in this volume, for their best efforts — it is their work that gives the meaning and *fuel* to the RST workshops. We would also like to express our thanks to the anonymous reviewers for providing the authors with detailed referees' reports improving the scientific quality of their submissions.

Our immense gratitude goes to Andrzej Skowron, the Honorary Chair of RST'2015, for his scientific and strategic leadership, and to Marcin Szczuka, the Organizing Chair, for his invaluable help and support throughout the whole preparation of the workshop.

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Last but not least, we would like to thank the International Rough Set Society, the University of Warsaw, and the Warsaw Center for Mathematics and Computer Science for sponsoring the workshop.

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