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James F. Peters · Andrzej Skowron (Eds.)

Transactions on Rough Sets XXI

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Preface

Volume XXI of the *Transactions on Rough Sets* (TRS) is a continuation of a number of research streams that have grown out of the seminal work of Zdzisław Pawlak[1] during the first decade of the twenty-first century.

Rough set theory in its applications to decision and knowledge engineering problems has to cope with uncertain or incomplete knowledge. Degrees of confidence as to results of decision algorithms or granulation algorithms or other procedures belong in the interval [0, 1] in spite of their finite number, hence, they fall into the realm of many-valued logics. As shown by Zdzisław Pawlak and Andrzej Skowron, many essential reasonings by means of a rough set approach can be carried out in terms of rough membership functions $\mu_X^B(x) = |[x]_B \bigcap X|/|[x]_B|$. This approach has been generalized by Lech Polkowski and Andrzej Skowron to a paradigm of rough mereology that treats the more general predicate $\mu(x, y, r)$, which reads: "x is a part of y to a degree at least r." The foundational role as a vehicle for reasoning modes in these approaches is played by many-valued logics proposed for the first time ever by Jan Łukasiewicz in his Farewell Lecture on March 7, 1918, at Warsaw University. We observe the centenary of this historic event with a chapter on Jan Łukasiewicz and his results by Lech Polkowski.

The paper co-authored by Jiajie Yu and Christopher J. Henry introduces an approach to simulating the task of human visual search defined in the context of descriptive topological spaces. The algorithm presented forms the basis of a descriptive visual search system (DVSS) that is based on the psychologically guided search model (GSM) for human visual search. The paper by Alexa Gopaulsingh defines and examines the consequences of double successive rough set approximations based on two generally unequal equivalence relations on a finite set. Algorithms to decompose a given defined operator into constituent parts are also presented. The paper by A. Mani presents dialectical rough logics from a semantic perspective, where a concept of dialectical predicates is formalized, connection with dialetheias and glutty negation are established, and parthood is analyzed and studied from the viewpoint of classic and dialectical figures of opposition. The paper by Lech Polkowski presents a logic for reasoning about parts and degrees of inclusion based on an abstract notion of a mass that generalizes geometric measure of area or volume and extends in the abstract manner the Łukasiewicz logical rendering of probability calculus. The paper by Łukasz Sosnowski presents mathematical foundations of a similarity-based reasoning approach for recognition of compound objects as well as applications in the fields of image recognition, text recognition, and risk management. The paper by Arkadiusz Wojna

[1] See, *e.g.*, Pawlak, Z., A Treatise on Rough Sets, *Transactions on Rough Sets* IV, (2006), 1–17. See, also, Pawlak, Z., Skowron, A.: Rudiments of rough sets, *Information Sciences* 177 (2007) 3–27; Pawlak, Z., Skowron, A.: Rough sets: Some extensions, *Information Sciences* 177 (2007) 28–40; Pawlak, Z., Skowron, A.: Rough sets and Boolean reasoning, *Information Sciences* 177 (2007) 41–73.

and Rafał Latkowski describes a new generation of the Rseslib library, which is available as a separate open-source library with API and with modular architecture aimed at high reusability and substitutability of its components. The new version can be used within Weka and with a dedicated graphical interface.

The editors would like to express their gratitude to the authors of all submitted papers. Special thanks are due to the following reviewers: Jan Bazan, Davide Ciucci, Ivo Düntsch, Anna Gomolińska, Ryszard Janicki, Jouni Järvinen, Piero Pagliani, Dominik Ślęzak, Sheela Ramanna, Marcin Wolski, and Wei-Zhi Wu.

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December 2018

James F. Peters
Andrzej Skowron

LNCS Transactions on Rough Sets

The *Transactions on Rough Sets* series has as its principal aim the fostering of professional exchanges between scientists and practitioners who are interested in the foundations and applications of rough sets. Topics include foundations and applications of rough sets as well as foundations and applications of hybrid methods combining rough sets with other approaches important for the development of intelligent systems. The journal includes high-quality research articles accepted for publication on the basis of thorough peer reviews. Dissertations and monographs up to 250 pages that include new research results can also be considered as regular papers. Extended and revised versions of selected papers from conferences can also be included in regular or special issues of the journal.

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