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Preface

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

These research streams include work on a promising rough set approach in machine learning by A. Janusz, the introduction of multi-valued near set theory by M.E. Abd El-Monsef, H.M. Abu-Donia and E.A. Marei, the advent of a complete system that supports a rough-near set approach to digital image analysis by C.J. Henry, and an exhaustive study of the mathematics of vagueness by A. Mani.

The first of these research streams focuses on an extension of the rule-based similarity (RBS) that is a dynamic rule-based similarity (DRBS) framework, an extension of the rule-based similarity (RBS) model by A. Janusz. RBS is an extension of the A. Tversky feature contrast model, where an object is represented by a set of features, object comparison depends on a feature matching function, and the representation of similarity is based on the contrast of the measures of object features[2]. DRBS represents a significant step forward in machine learning inasmuch as DRBS makes it possible to learn a similarity relation from high-dimensional data. A significant application of DBRS is in DNA microarray data mining.

The second of the research streams represented by M.E. Abd El-Monsef, H.M. Abu-Donia and E.A. Marei in TRSXV considers the nearness of objects in terms of an extended approximation space model[3] and a new approach to near sets based on several types of neighborhoods that takes its cue from topological rough sets[4]. The main results in this paper are that a right (left) lower neighborhood coverage is near the corresponding right (left) upper neighborhood coverage and that topologies are generated from families of neighborhoods.

The third research stream in TRSXV is represented by C.J. Henry's near set evaluation and recognition (NEAR) system. It can be observed that the approach

[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.

[2] A. Tversky, Features of similarity, Psych. Review 84 (1977), 327–352, especially A. Tversky, D.H. Krantz, The dimensional representation and metric structure of similarity data, J. Math. Psych. 7 (1970), 572-597.

[3] J.F. Peters, A. Skowron, J. Stepaniuk, Nearness of objects: Extension of approximation space model, Fund. Info. 79 (/4) (2007), 497-512.

[4] A. Wiweger, On topological rough sets, Bull. Pol. Akad., Math. 37 (1989), 89-93.

to describing the nearness of objects in terms of feature vectors is actually an alternative to A. Tversky's view of object similarity defined by sets of features in representing objects. Henry carries forward the feature vector approach to describing objects with the introduction of visual rough sets and an approach to measuring the similarity of disjoint rough sets. Henry's proposed approach is useful in digital image analysis as well as in content-based image retrieval.

The fourth research stream is represented by A. Mani in TRSXV in a study of the mathematics of vagueness. Mani introduces a structure called a rough Y-system that captures a minimum common fragment of different rough set theories. The article by Mani in this volume is broad in scope inasmuch as it considers the category Rough, Y. Yao's information granule model, contamination of object perception by meta-level consideration of objects of all types vs. classes of equivalent objects, objectivity in the computation by rough inclusion methods, axiomatic approach to information granules, various forms of rough set theory considered relative discernibility, and classification of rough set theories.

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James F. Peters
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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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