PREFACE

Knowledge discovery is a process which helps to make sense of data in a more applicable form. The knowledge discovery process and its data mining are becoming the focus of many fields. Sufficient methods of extracting knowledge from databases or multivariate experimental data sets belong to basic information processing steps. In particular, consideration of implicit, imprecise, and insufficient knowledge in databases or experimental data sets is very important in developing knowledge-based systems. Another fundamental problem in multidimensional pattern processing is dimensionality reduction including feature extraction and reduction relevant for robust prediction. The rough sets theory has been developed for knowledge discovery in databases and experimental data sets. This theory provides a powerful foundation for revealing and discovering important structures in data and for classifying complex objects. An attribute-oriented rough sets technique reduces the computational complexity of learning processes and eliminates the unimportant or irrelevant attributes. Rough sets were introduced by Professor Zdzislaw Pawlak in 1982 to provide a systematic framework for studying imprecise and insufficient knowledge. The information system proposed by Professor Pawlak is for representing knowledge and discovering relationships in data and has been studied in the context of rule-based systems, decision support systems, inductive reasoning, pattern recognition, classification, and machine learning. The use of rough sets has been shown to be very effective for revealing relationships within data, discovering dependencies among objects and attributes, evaluating the classificatory importance of attributes, and removing data redundancies.

Some classes of objects in an information system cannot be distinguished using the available attributes. They can only be roughly, or approximately, defined. The idea of rough sets is based on equivalence relations which partition a data set into equivalence classes, and it consists in the approximation of a set by a pair of sets, called lower and upper approximations. The lower approximation of a set of objects (a concept) contains all objects that, based on the knowledge of a given sets of attributes, can be classified as certainly belonging to the concept. The upper approximation of a set contains all objects that cannot be classified categorically as not belonging to the concept. A rough set is defined as an approximation of a set, defined as a pair of

sets: the upper and lower approximations of a set. Rough sets also provide numerical measure of classification approximation. The rough sets theory can be used in different stages of data processing. For example, it can be used to:

- analyze knowledge
- analyze consistency in data sets
- compute lower and upper approximations of sets
- identify and evaluate a dependence of a set of attributes
- calculate a discriminatory power of an attribute
- reduce data by removing superfluous attributes
- derive a classifier as a set of production rules, etc.

Rough sets theory has been successfully applied in many disciplines.

This special issue *International Journal of Applied Mathematics and Computer Sciences* gathers papers focusing on various theoretical and practical aspects of rough sets. There have been several persons helping in preparing this special issue. The authors, editors and reviewers deserve sincere thanks.

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