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PREFACE

On behalf of the authors of this volume we would like to extend our best wishes to Professor Zdzislaw Pawlak on his 70-th anniversary wishing him good health and many years of continued successful research activity

Professor Zdzislaw Pawlak devoted many years of his fruitful research activity to theoretical foundations of Computer Science. By gathering young investigators around him he created the first significant research group working in theoretical foundations of Computer Science in Poland. Some years later the group developed into numerous teams working both in Poland and abroad. Many of them have acquired high scientific positions and reputation within the international Computer Science community.

Undoubtedly, Professor Pawlak's success in the field can be attributed to his ability to choose the right research topic, to his enthusiasm and deep involvement in a research investigation and to his unlimited friendliness and willingness to cooperate with others. His research results led to over one hundred research papers and books of his own and hundreds of other works inspired or supervised by him.

The theory of rough sets emerged with the works of Pawlak. During the last dozen years or so he focused his research on this theory and its applications. The topic of rough sets generated the ever increasing interest of theoreticians as well as of practitioners. Rough set theory seems to be a perfect example of Pawlak's approach to research. His ultimate goal was to keep his research as close as possible to practical applications, to produce tools for solving real-life problems. This goal has been successfully achieved as illustrated in numerous instances of practical applications. Besides numerous theoretical publications on rough sets, there are equally numerous implemented and initiated projects made possible by the existing solid theoretical foundations.

In conclusion, we would like to express our deep gratitude to Professor Pawlak for having introduced us to the fascinating world of research on inference with uncertain information and particularly into the theory and applications of rough sets.

Andrzej Skowron, Editor and Wojciech Ziarko, Special Issue Editor

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EDITORIAL

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The ability to classify observations is considered to be one of the fundamental characteristics of intelligent behaviour. Decision making based on some information inputs such as pattern recognition or diagnosis are all classification tasks occurring in our daily lives. Despite the generality and the fundamental nature of the classification task it was not until recently captured and modelled in basic formal theories such as set theory or formal logic. On the other hand, attempts to construct data-driven learning or pattern recognition systems exposed the lack of methodologies for precise and formal studies of the basics of related classification problems such as the classification of a noisy sound wave for speech recognition or the classificatory decision analysis for the purpose of control algorithm acquisition. The introduction of the idea of approximately specified or rough set by Zdzislaw Pawlak seems to fill this methodological void.

The theory of rough sets is a relatively new mathematical methodology concerned with the analysis and modelling of classification and decision problems involving vague, imprecise, uncertain or incomplete information. The main characteristic of this methodology is the formal recognition of the fact that classification of objects of a certain universe into categories based on information present in some observable properties of the objects results in a limited abilty to distinguish them. In general, only classes of objects rather than individuals can be distinguished with such *classification information*. Situations of this kind occur quite often in real life situations, for example in control or medicine, where sensor readings or test results are used to characterize the state of objects of interest. In the theory of rough sets the ability to classify things is considered to be one of the elementary notions of the model. In other words, the representation of the classification of the possibly infinite universe of interest models our knowledge about the universe. Depending on the quality of the knowledge, subsets of the universe can, or cannot be precisely characterized. If precise characterization is not possible, the rough sets theory introduces an approximate characterization in terms of set lower and upper approximations.

The implications of these simple definitions of set approximations are enormous. They led to extensions of basic systems of formal logic to accomodate uncertain information, resulted in numerous new algorithms for decision logic analysis, machine learning, data mining, control algorithm acquisition, pattern recognition and other applications. Some of these research results and applications are included in this volume. The articles presented here reflect spectra of research directions and applications inspired by the idea of rough sets. The articles have been selected from fifty papers included in the program of the International Workshop on Rough Sets and Knowledge Discovery held in Banff, Canada, in October 1993. The workshop was organized with the support of the University of Regina, Regina, Canada, the Natural Sciences and Engineering Research Council of Canada and the American Association for Artificial Intelligence.