

PREFACE

The idea of the special issue entitled *Neuro-Fuzzy and Soft Computing* arose in May 1999, after the Fourth Conference on *Neural Networks and Their Applications*. The conference was organized by the Polish Neural Networks Society in cooperation with the IEEE Neural Networks Council and the Department of Computer Engineering at the Technical University of Częstochowa, Poland. This conference was held in Zakopane, the previous ones in Kule (1994, 1997) and Szczyrk (1996), in Poland. Although the title of these conferences refers to neural networks and most of the conference sessions were concerned with the theory and applications of neural networks, there were also some papers related to fuzzy systems and genetic algorithms. During the last years we had been observing a growing number of contributions about combinations of neural networks, fuzzy systems, and evolutionary algorithms. Therefore, we proposed to extend the conference subject and organize sessions on fuzzy and neuro-fuzzy systems, as well as evolutionary algorithms. As a result of our discussion with the Organizing Committee Chairman, Prof. Leszek Rutkowski, and other Committee Members, the last Conference changed its name. It was the Fifth Conference on *Neural Networks and Soft Computing*, held in Zakopane, Poland, in June, 2000.

The outcome of the Fourth Conference on *Neural Networks and Their Applications* (Zakopane, Poland, 1999) is the special issue of the International Journal of Applied Mathematics and Computer Science, entitled *Neuro-Fuzzy and Soft Computing*. The contributions to the volume are related to both conferences. However, this issue is not intended to be a collection of extended versions of selected papers presented at the conferences and included in the *Conference Proceedings*. Some Authors participated in one or both of these conferences, or even in the previous ones. Their contributions are similar, slightly related or different from the conference papers. Other Authors, not participants of the conferences, have also contributed very good papers to this volume, on the subject of neuro-fuzzy systems and soft computing. One of these contributions is the first paper, written by Prof. Hideyuki Takagi from Japan, about neural networks and fuzzy systems. It can be treated as a great introduction to neuro-fuzzy systems as well as neuro-fuzzy-genetic combinations. The other paper, by Prof. Witold Pedrycz from Canada, is an interesting contribution to neural networks and soft computing. This subject is similar to that of his invited paper presented during the Conference on *Neural Networks and Soft Computing*, in Zakopane, 2000. Other papers, in this special volume, deal with fuzzy or neuro-fuzzy systems, and the last group of the papers addresses neural networks. Recent results of research in the framework of Soft Computing are collected in this special issue.

The title of the volume *Neuro-Fuzzy and Soft Computing* refers to the contents of the contributed papers. As mentioned before, they deal with neural networks, fuzzy systems, and their combinations, i.e. neuro-fuzzy systems. These methods are the main constituents of Soft Computing. Others, belonging to this area, are genetic algorithms, as well as probabilistic reasoning, and chaotic theory. Soft Computing is a partnership

of distinct methods that in one way or another conform to its guiding principle. At this juncture, the dominant aim of soft computing is to exploit the tolerance for imprecision and uncertainty to achieve tractability, robustness, and low solution cost. Fuzzy logic is mainly concerned with imprecision, approximate reasoning, and computing with words, while neurocomputing with learning, adaptation, and system identification. It is advantageous to combine them in order to create neuro-fuzzy systems. These techniques are used in many consumer products and other applications. The different soft computing methods are treated to be complementary, not competitive. This concept allows us to make the best of their merits and avoid their drawbacks. For example, genetic algorithms can help to find an initial point for the back-propagation method of neural network learning. The emergence of neurocomputing and genetic algorithms — in the middle 80's — as highly effective methodologies for the conception and design of learning, adaptive and self-organizing systems — had a significant impact on the development of fuzzy logic. Hybrid systems employing a combination of fuzzy logic, neurocomputing and genetic algorithms are likely to become ubiquitous. The growing use of soft computing has made an important contribution to the conception, design and deployment of intelligent systems.

We would like to thank the Authors for their valuable contributions to the volume and the Reviewers for their opinions and very helpful comments that have improved final versions of some papers. We greatly appreciate their job, very important in the process of creating this issue of the *International Journal of Applied Mathematics and Computer Science*. We have enjoyed our work in order to complete this volume, especially the frequent contacts with the Authors and the Reviewers. We would like to express our sincere gratitude to the Editor-in-Chief, Prof. Józef Korbcicz, for inviting us as guest-editors of this special issue of the Journal. We hope that Readers will find this volume interesting, informative, and stimulating to further research.

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