Włodzisław Duch
Janusz Kacprzyk
Erkki Oja
Sławomir Zadrożny (Eds.)

Artificial Neural Networks: Formal Models and Their Applications – ICANN 2005

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Artificial Neural Networks: Formal Models and Their Applications – ICANN 2005

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Preface

This volume is the first part of the two-volume proceedings of the International Conference on Artificial Neural Networks (ICANN 2005), held on September 11–15, 2005 in Warsaw, Poland, with several accompanying workshops held on September 15, 2005 at the Nicolaus Copernicus University, Toruń, Poland.

The ICANN conference is an annual meeting organized by the European Neural Network Society in cooperation with the International Neural Network Society, the Japanese Neural Network Society, and the IEEE Computational Intelligence Society. It is the premier European event covering all topics concerned with neural networks and related areas. The ICANN series of conferences was initiated in 1991 and soon became the major European gathering for experts in those fields.

In 2005 the ICANN conference was organized by the Systems Research Institute, Polish Academy of Sciences, Warsaw, Poland, and the Nicolaus Copernicus University, Toruń, Poland.

From over 600 papers submitted to the regular sessions and some 10 special conference sessions, the International Program Committee selected – after a thorough peer-review process – about 270 papers for publication. The large number of papers accepted is certainly a proof of the vitality and attractiveness of the field of artificial neural networks, but it also shows a strong interest in the ICANN conferences. Because of their reputation as high-level conferences, the ICANN conferences rarely receive papers of a poor quality and thus their rejection rate may be not as high as that of some other conferences. A large number of accepted papers meant that we had to publish the proceedings in two volumes. Papers presented at the post-conference workshops will be published separately.

The first of these volumes, *Artificial Neural Networks: Biological Inspirations*, is primarily concerned with issues related to models of biological functions, spiking neurons, understanding real brain processes, development of cognitive powers, and inspiration from such models for the development and application of artificial neural networks in information technologies, modeling perception and other biological processes. This volume covers dynamical models of single spiking neurons, their assemblies, population coding, models of neocortex, cerebellum and subcortical brain structures, brain–computer interfaces, and also the development of associative memories, natural language processing and other higher cognitive processes in human beings and other living organisms. Papers on self-organizing maps, evolutionary processes, and cooperative biological behavior, with some applications, are also included. Natural perception, computer vision, recognition and detection of faces and other natural patterns, and sound and speech signal analysis are the topics of many contributions in this volume. Some papers on bioinformatics, bioengineering and biomedical applications are also included in this volume.

The second volume, *Artificial Neural Networks: Formal Models and Their Applications*, is mainly concerned with new paradigms, architectures and formal models of artificial neural networks that can provide efficient tools and techniques to model

a great array of non-trivial real-world problems. All areas that are of interest to the neural network community are covered, although many computational algorithms discussed in this volume are only remotely inspired by neural networks. A perennial question that the editors and reviewers always face is: how to define the boundary or the limits of a field? What should still be classified as an artificial neural network and what should be left out as a general algorithm that is presented in the network form? There are no clear-cut answers to these questions. Support vector machines and kernel-based methods are well established at neural network conferences although their connections with neural networks are only of a historical interest. Computational learning theory, approximation theory, stochastic optimization and other branches of statistics and mathematics are also of interest to many neural network experts. Thus, instead of asking: Is this still a neural method?, we have rather adopted a policy of accepting all high-quality papers that could be of interest to the neural network community.

A considerable part of the second volume is devoted to learning in its many forms, such as unsupervised and supervised learning, reinforcement learning, Bayesian learning, inductive learning, ensemble learning, and their applications. Many papers are devoted to the important topics in classification and clustering, data fusion from various sources, applications to systems modeling, decision making, optimization, control, prediction and forecasting, speech and text analysis and processing, multimedia systems, applications to various games, and other topics. A section on knowledge extraction from neural networks shows that such models are not always opaque, black boxes. A few papers present also algorithms for fuzzy rule extraction using neural approaches. Descriptions of several hardware implementations of different neural algorithms are also included. Altogether this volume presents a variety of theoretical results and applications covering most areas that the neural network community may be interested in.

We would like to thank, first of all, Ms. Magdalena Gola and Ms. Anna Wilbik for their great contribution in the preparation of the proceedings. Moreover, Ms. Magdalena Gola, Ms. Anna Wilbik, and Ms. Krystyna Warzywoda, with her team, deserve our sincere thanks for their help in the organization of the conference. Finally, we wish to thank Mr. Alfred Hofmann, Ms. Anna Kramer and Ms. Ursula Barth from Springer for their help and collaboration in this demanding publication project.

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