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# Artificial Neural Networks – ICANN 2009

19th International Conference  
Limassol, Cyprus, September 14-17, 2009  
Proceedings, Part I

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## Preface

This volume is part of the two-volume proceedings of the 19th International Conference on Artificial Neural Networks (ICANN 2009), which was held in Cyprus during September 14–17, 2009. The ICANN conference is an annual meeting sponsored by the European Neural Network Society (ENNS), in cooperation with the International Neural Network Society (INNS) and the Japanese Neural Network Society (JNNS). ICANN 2009 was technically sponsored by the IEEE Computational Intelligence Society. This series of conferences has been held annually since 1991 in various European countries and covers the field of neurocomputing, learning systems and related areas.

Artificial neural networks provide an information-processing structure inspired by biological nervous systems. They consist of a large number of highly interconnected processing elements, with the capability of learning by example. The field of artificial neural networks has evolved significantly in the last two decades, with active participation from diverse fields, such as engineering, computer science, mathematics, artificial intelligence, system theory, biology, operations research, and neuroscience. Artificial neural networks have been widely applied for pattern recognition, control, optimization, image processing, classification, signal processing, etc.

In 2009, the ICANN conference was organized by the KIOS Research Center for Intelligent Systems and Networks and the Department of Electrical and Computer Engineering of the University of Cyprus. The conference was held at the seaside city of Limassol, which is the second largest city in Cyprus. The participants had the opportunity to enjoy the technical program, as well as the rich cultural heritage of Cyprus, whose 9,000-year cultural legacy has been at the crossroads of world history. Currently, Cyprus is a full member of the European Union that combines European culture with ancient enchantment.

Out of approximately 300 paper submissions to ICANN 2009, the Program Committee selected about 200 papers, which are published in the two volumes of these proceedings. The selection of the accepted papers was made after a thorough peer-review process, where each submission was evaluated by at least three reviewers. The submitted papers were authored by peer scholars coming from 47 countries, which geographically cover the whole planet (Europe, Middle East, Africa 69%; Asia/Pacific 18%; Americas 13%). The large number of accepted papers, variety of topics and high quality of submitted papers reflect the vitality of the field of artificial neural networks. In addition to the regular papers, the technical program featured keynote plenary lectures by worldwide renowned scholars, two tutorials on exciting new topics, two competitions on immunology and environmental toxicology prediction, and two workshops. One of the workshops was supported by the EU-sponsored COST Action "Intelligent Monitoring, Control and Security of Critical Infrastructure Systems" (IntelliCIS).

The two-volume proceedings contain papers on the following topics: Learning Algorithms; Computational Neuroscience; Hardware Implementations and Embedded Systems; Self Organization; Intelligent Control and Adaptive Systems; Neural and Hybrid

Architectures; Support Vector Machines; Recurrent Neural Networks; Neuro-informatics and Bioinformatics; Cognitive Machines; Data Analysis and Pattern Recognition; Signal and Time Series Processing; Applications; Neural Dynamics and Complex Systems; Vision and Image Processing; Neuro-evolution and Hybrid Techniques for Mobile Agents Control; Neural Control, Planning and Robotics Applications; Intelligent Tools and Methods for Multimedia Annotation; Critical Infrastructure Systems.

It is our pleasure to express our gratitude to everybody that contributed to the success of ICANN 2009. In particular, we thank the members of the Board of the European Neural Networks Society for entrusting us with the organization of the conference, as well as for their assistance during the preparation of ICANN 2009. Special thanks to the President of ENNS, Wlodzislaw Duch, who helped significantly toward the success of the conference. We would like to express our sincere gratitude to the members of the Program Committee and all the reviewers, who did a tremendous job under strict time limitations during the reviewing process. We thank the members of the Organizing Committee for the great effort in the organization of the conference and the members of the Local Organizing Committee for their assistance. We are grateful to the University of Cyprus (ECE Department) and the Cyprus Tourist Organization for their financial support. We thank the conference secretariat, Top Kinisis, and especially Christina Distra, for their excellent and timely support in the organization of the conference. We are grateful to several researchers at the University of Cyprus and the Politecnico di Milano, who assisted in various ways in the organization of ICANN 2009, and especially Alexandros Kyriakides and Andreas Kartakoullis, who spent several days working on the formatting of the final proceedings, and Manuel Roveri, who addressed several software-related and procedural problems raised during the review process. We would also like to thank the publisher, Springer, for their cooperation in publishing the proceedings in the prestigious series of *Lecture Notes in Computer Science*. Finally, we thank all the authors who contributed to this volume for sharing their new ideas and results with the community. We hope that these ideas will generate further new ideas and innovations for the benefit of society and the environment.

July 2009

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