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Computational Intelligence and Bioinspired Systems

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Volume Editors

Joan Cabestany
Universitat Politècnica de Catalunya (UPC), E.T.S.I. Telecomunicación
Departamento de Ingeniería Electrónica
Campus Nord, Edificio C4, C/ Jordi Girona, 1-3, 08034 Barcelona, Spain
E-mail: cabestan@eel.upc.edu

Alberto Prieto
Universidad de Granada, E.T.S.I. Informática
Departamento de Arquitectura de Computadores
C/ Periodista Daniel Saucedo, s/n, 18071 Granada, Spain
E-mail: aprieto@ugr.es

Francisco Sandoval
Universidad de Málaga, E.T.S.I. de Telecomunicación
Departamento de Tecnología Electrónica
Campus Universitario de Teatinos, 29071 Málaga, Spain
E-mail: sandoval@dte.uma.es

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Preface

We present in this volume the collection of finally accepted papers of the eighth edition of the "IWANN" conference ("International Work-Conference on Artificial Neural Networks"). This biennial meeting focuses on the foundations, theory, models and applications of systems inspired by nature (neural networks, fuzzy logic and evolutionary systems).

Since the first edition of IWANN in Granada (LNCS 540, 1991), the Artificial Neural Network (ANN) community, and the domain itself, have matured and evolved. Under the ANN banner we find a very heterogeneous scenario with a main interest and objective: to better understand nature and beings for the correct elaboration of theories, models and new algorithms. For scientists, engineers and professionals working in the area, this is a very good way to get solid and competitive applications.

We are facing a real revolution with the emergence of embedded intelligence in many artificial systems (systems covering diverse fields: industry, domotics, leisure, healthcare, …). So we are convinced that an enormous amount of work must be, and should be, still done. Many pieces of the puzzle must be built and placed into their proper positions, offering us new and solid theories and models (necessary tools) for the application and praxis of these current paradigms.

The above-mentioned concepts were the main reason for the subtitle of the IWANN 2005 edition: *"Computational Intelligence and Bioinspired Systems."* The call for papers was launched several months ago, addressing the following topics:

1. **Mathematical and theoretical methods in computational intelligence.** Complex and social systems; evolutionary and genetic algorithms; fuzzy logic; mathematics for neural networks; RBF structures; self-organizing networks and methods; support vector machines.
2. **Neurocomputational formulations.** Single-neuron modeling; perceptual modeling; system-level neural modeling; spiking neurons; models of biological learning.
3. **Learning and adaptation.** Adaptive systems; imitation learning; reconfigurable systems; supervised, non-supervised, reinforcement and statistical algorithms.
4. **Emulation of cognitive functions.** Decision making; multi-agent systems; multi-sensory integration; natural languages; pattern recognition; perceptual and motor functions (visual, auditory, tactile, etc.); robotics; planning motor control.
5. **Bioinspired systems and neuroengineering.** Embedded neural networks and fuzzy systems; evolvable computing; evolving hardware; microelectronics for neural, fuzzy and bioinspired systems; neural prostheses; retinomorphic systems.
6. **Applications.** Biomimetic applications; data analysis and preprocessing; data mining; economics and financial engineering; fuzzy systems for control; the internet; neural networks for control; power systems; signal processing; telecommunication applications; time series and prediction.

After a careful review process of the more than 240 submissions, 150 papers were accepted for publication including the contribution of three invited speakers. In this edition a special emphasis was put on the organization of special sessions. A total of 10 sessions containing 46 papers were accepted for presentation, covering specific aspects like the modelling of neurons, design of neural topologies, applications, etc. This review and selection process was done with the help and cooperation of the members of our International Program Committee.

The organization of this book does not follow the scheme and the order of the main mentioned topics, but is organized in a rational way according to the contents of the accepted papers, going from the more abstract concepts to the concrete and applicable questions and considerations. The result is a 20-chapter volume with the following main parts:

1. Mathematical and Theoretical Methods
2. Evolutionary Computation
3. Neurocomputation-Inspired Models
4. Learning and Adaptation
5. Radial Basis Function Structures
6. Self-organizing Networks and Methods
7. Support Vector Machines
8. Cellular Neural Networks
9. Hybrid Systems
10. Neuroengineering and Hardware Implementations
11. Pattern Recognition
12. Perception and Robotics
13. Applications on Data analysis and Preprocessing
14. Applications on Data Mining
15. Applications on Signal Processing
16. Applications on Image Processing
17. Applications on Forecasting
18. Applications on Independent Component Analysis and Blind Source Separation
19. Applications on Power Systems
20. Other Applications

IWANN 2005 was organized by the Universitat Politècnica de Catalunya, UPC, with the strong cooperation of the Universidad de Granada and the Universidad de Málaga. Sponsorship was obtained from the organizing university, UPC, the Spanish Ministerio de Educación y Ciencia, the AGAUR agency of the Generalitat de Catalunya, and the City Council of Vilanova i la Geltrú.

We would like to express our gratitude to the members of the IWANN Organizing Committee, and to all the people who participated in the event (delegates, invited speakers, special session organizers). The editors would like to address a special mention to the people who helped in the review process as special or additional reviewers.

Finally, we would like to thank Springer, and especially Alfred Hofmann and Anna Kramer, for their continuous support and cooperative work from the very beginning of the IWANN conferences.

June 2005

Joan Cabestany, Universitat Politècnica de Catalunya
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