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# Computational and Ambient Intelligence

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# Preface

We present in this volume the collection of finally accepted papers to the ninth edition of 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 Computational Intelligence community, and the domain itself, have matured and evolved. Under the Computational Intelligent banner we find a very heterogeneous scenario with a main interest and objective: to better understand nature and natural entities for the correct elaboration of theories, models and new algorithms. For scientifics, engineers and professionals working in the area, this is a very good way to get real, solid and competitive applications.

More and more, these new computational techniques are used in applications that try to bring a new situation of well-being to the user. The conjunction of a more and more miniaturized hardware together with the growing computational intelligence embodied in this hardware lead us towards fully integrated embedded systems-on-a-chip and opens the door for truly ubiquitous electronics.

In this IWANN edition we have tried to bring near the computational intelligence to the ambient one, looking for environments that are sensitive, adaptive and responsive to the presence of people and objects, where technology is embedded, hidden in the background, environments that augment activities through smart nonexplicit assistance. Anyway, environments that preserve security, privacy and trustworthiness while utilizing information when needed and appropriate (Fred Boekhorst, Philips, ISSCC02).

The above concepts were the main reason for the subtitle of the IWANN 2007 edition: *"Computational and Ambient Intelligence"*. The call for papers was lunched 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 modelling. Perceptual modelling. System-level neural modelling. 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. Sensor mesh. Natural language. Pattern recognition. Perceptual and motor function (visual, auditory, tactile, virtual reality, etc.). Robotics. Planning motor control.
5. **Bio-inspired systems and neuro-engineering.** Embedded intelligent systems. Evolvable computing. Evolving hardware. Microelectronics for neural, fuzzy and bioinspired systems. Neural prostheses. Retinomorphic systems. Nanosystems. Nanocognitive Systems.
6. **Applications.** Adaptive interfaces. Ambient intelligent. Biomimetic applications. Data analysis and pre-processing. Data mining. Economy and

financial engineering. Fuzzy systems for control. Internet. Neural networks for control. Power systems. Signal processing. Telecommunication applications. Time series and prediction.

After a careful review process of the more than 260 submissions, 145 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 7 special sessions containing 51 papers have been accepted for presentation, covering specific aspects like neural inspired architectures for nanoelectronics, kernel methods, nature-inspired intelligent methods and applications, assistive technologies and e-health, etc. The review and selection process was done with the help and cooperation of the Special Session organizers. We would like to thank them the effort and good work done.

The organization of this book does not follow the scheme and the order of the above 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 chapters' volume with the following main parts:

1. Theoretical concepts and neurocomputational formulations.
2. Inmproving models and learning procedures.
3. Self-organizing networks.
4. Kernel methods.
5. Evolutionary and genetic algorithms.
6. Evolutionary learning.
7. Fuzzy systems.
8. Neuroengineering and Hardware Implementations.
9. Data analysis.
10. Signal processing.
11. Speech processing.
12. Images processing.
13. Time series and prediction.
14. Robotics and planning motor control.
15. Power system applications.
16. Internet and web applications.
17. Biomedical applications.
18. Neural networks and other Machine Learning methods in cancer research.
19. Assistive technologies and e-Health.
20. Other Applications.

IWANN 2007 edition have been organized by the Spanish Chapter of the IEEE Computational Intelligence Society, the Universidad de Granada, the Universidad de Málaga, and the Universidad Politécnica de Catalunya. The Universidad del País Vasco has been mainly engaged in the local organization. Sponsorship was obtained from the Spanish Ministerio de Educación y Ciencia, Universidad del Pais Vasco grants, the City Council of San Sebastián and Basc Government support.

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 to address a special mention to the people who helped in the review process as special or additional reviewers.

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

June 2007

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