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Hybrid Artificial Intelligence Systems

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Preface

The 5th International Conference on Hybrid Artificial Intelligence Systems (HAIS 2010) has become a unique, established and broad interdisciplinary forum for researchers and practitioners who are involved in developing and applying symbolic and sub-symbolic techniques aimed at the construction of highly robust and reliable problem-solving techniques, and bringing the most relevant achievements in this field. Overcoming the rigid encasing imposed by the arising orthodoxy in the field of artificial intelligence, which has led to the partition of researchers into so-called areas or fields, interest in hybrid intelligent systems is growing because they give freedom to design innovative solutions to the ever-increasing complexities of real-world problems. Noise and uncertainty call for probabilistic (often Bayesian) methods, while the huge amount of data in some cases asks for fast heuristic (in the sense of suboptimal and ad-hoc) algorithms able to give answers in acceptable time frames. High dimensionality demands linear and non-linear dimensionality reduction and feature extraction algorithms, while the imprecision and vagueness call for fuzzy reasoning and linguistic variable formalization. Nothing impedes real-life problems to mix difficulties, presenting huge quantities of noisy, vague and high-dimensional data; therefore, the design of solutions must be able to resort to any tool of the trade to attack the problem. Combining diverse paradigms poses challenging problems of computational and methodological interfacing of several previously incompatible approaches. This is, thus, the setting of HAIS conference series, and its increasing success is the proof of the vitality of this exciting field.

This volume of *Lecture Notes on Artificial Intelligence* (LNAI) includes accepted papers presented at HAIS 2010 held in the framework of the prestigious “Cursos de Verano of the Universidad del País Vasco” at the beautiful venue of Palacio de Miramar, San Sebastián, Spain, in June 2010.

Since its first edition in Brazil in 2006, HAIS has become an important forum for researchers working on fundamental and theoretical aspects of hybrid artificial intelligence systems based on the use of agents and multi-agent systems, bioinformatics and bio-inspired models, fuzzy systems, artificial vision, artificial neural networks, optimization models and alike.

HAIS 2010 received 269 technical submissions. After a rigorous peer-review process, the International Program Committee selected 133 papers which are published in these conference proceedings. In this edition emphasis was put on the organization of special sessions. Fourteen special sessions, containing 84 papers, were organized on the following topics:

- Real-World HAIS Applications and Data Uncertainty
- Computational Intelligence for Recommender Systems
- Signal Processing and Biomedical Applications
- Methods of Classifiers Fusion
- Knowledge Extraction Based on Evolutionary Learning

- Systems, Man, and Cybernetics by HAIS Workshop
- Hybrid Intelligent Systems on Logistics
- Hybrid Reasoning and Coordination Methods on Multi-Agent Systems
- HAIS for Computer Security
- Hybrid and Intelligent Techniques on Multimedia
- Hybrid ANNs: Models, Algorithms and Data
- Hybrid Artificial Intelligence Systems Based on Lattice Theory
- Information Fusion: Frameworks and Architectures

The selection of papers was extremely rigorous in order to maintain the high quality of the conference, and we would like to thank the Program Committee for their hard work in the reviewing process. This process is very important for the creation of a conference of high standard, and the HAIS conference would not exist without their help.

The large number of submissions is certainly not only testimony to the vitality and attractiveness of the field but an indicator of the interest in the HAIS conferences themselves.

As a follow-up of the conference, we anticipate further publication of selected papers in special issues scheduled for the following journals:

- *Information Science*, Elsevier
- *Neurocomputing*, Elsevier
- *Journal of Mathematical Imaging and Vision*, Springer
- *Information Fusion*, Elsevier
- *Logic Journal of the IPL*, Oxford Journals

HAIS 2010 enjoyed outstanding keynote speeches by distinguished guest speakers:

- Gerhard Ritter, University of Florida (USA)
- Mihai Dateu, Paris Institute of Technology, Telecom Paris (France)
- Marios Polycarpou, University of Cyprus (Cyprus)
- Ali-Akbar Ghorbani, University of New Brunswick (Canada)
- James Llinas, Universidad Carlos III de Madrid (Spain)
- Éloi Bossé, Defence Research and Development Canada (DRDC Valcartier) (Canada)

We would like to fully acknowledge support from the GICAP Group of the University of Burgos, the BISISTE Group from the University of Salamanca, the GIC (www.ehu.es/ccwintco), Vicerrectorado de Investigación and the Cursos de Verano of the Universidad del País Vasco, the Departamento de Educación, Ciencia y Universidades of the Gobierno Vasco, Vicomtech, and the Ministerio de Ciencia e Investigación. The IEEE Systems, Man & Cybernetics Society, through its Spanish chapter, and the IEEE-Spanish Section also supported this event. We also want to extend our warm gratitude to all the Special Session Chairs for their continuing support to the HAIS series of conferences.

We wish to thank Alfred Hoffman and Anna Kramer from Springer for their help and collaboration during this demanding publication project. The local organizing team (Alexandre Manhaes Savio, Ramón Moreno, Maite García Sebastian, Elsa Fernandez, Darya Chyzyk, Miguel Angel Veganzones, Ivan Villaverde) did a superb job. Without their enthusiastic support the whole conference burden would have crushed our frail shoulders.

June 2010

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Methods of Classifiers Fusion

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Hybrid ANN: Models, Data Models, Algorithms and Data

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Hybrid Artificial Intelligence Systems Based on Lattice Theory

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Information Fusion: Frameworks and Architectures

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