

# Advances in Artificial Neural Networks and Computational Intelligence

## Special Issue of IWANN 2013

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### Preface

IWANN is a biennial conference that seeks to provide a discussion forum for scientists, engineers, educators and students about the latest ideas and realizations in the foundations, theory, models and applications of hybrid systems inspired on nature (neural networks, fuzzy logic and evolutionary systems) as well as in emerging areas related to the above items. As in previous editions of IWANN, it also aims to create a friendly environment that could lead to the establishment of scientific collaborations and exchanges among attendees.

Since the first edition in Granada (LNCS 540, 1991), the conference has evolved and matured, and most of the topics involved have achieved a maturity and reinforced consolidation. The twelveth edition of the IWANN conference “International Work-Conference on Artificial Neural Networks” was held in Puerto de la Cruz, Tenerife, (Spain) during June 12–14, 2013. The list of topics in the successive Call for Papers has also evolved, resulting in the following list for the present edition:

1. Mathematical and theoretical methods in computational intelligence.
2. Neurocomputational formulations.

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3. Learning and adaptation.
4. Emulation of cognitive functions.
5. Bio-inspired systems and neuro-engineering.
6. Advanced topics in computational intelligence.
7. Applications.

At the end of the submission process of IWANN 2013, and after a careful peer review and evaluation process (each submission was reviewed by at least 2, and on the average 2.9, program committee members or additional reviewers), 116 papers were accepted for oral or poster presentation, according to the recommendations of reviewers and the authors' preferences.

High-quality candidate papers (10 contributions) were invited to submit an extended version of their conference paper to be considered for special publication in this issue of *Neural Processing Letters*. These authors were selected after the recommendation of the reviewers of the conference papers, the opinion of the chairs of the different sessions and the guest editors. At least three independent and anonymous experts again carefully reviewed the extended versions and finally 8 papers were selected as appropriate for publication. In the present issue of *Neural Processing Letters*, it is a pleasure to present you these contributions that provide a clear overview of the thematic areas covered by the IWANN conference, ranging from theoretical aspects to real-world applications of nature-inspired system.

The first paper, "Multi-sensor fusion based on asymmetric decision weighting for robust activity recognition" by Oresti Banos et al. is focused in the field of recognition of human activity, and instead of working in ideal conditions, this contribution address crucial real-world issues. One of the most prominent challenges refers to common sensor technological anomalies, and presents a novel model devised to cope with the effects introduced by sensor technological anomalies.

The paper "Using Discriminative Dimensionality Reduction to Visualize Classifiers" by Alexander Schulz et al. the authors present a general framework on how to visualize a given classifier and its behavior as concerns a given data set in two dimensions. The contribution is based on nonlinear dimensionality reduction, and visualize classifiers such as Support Vector Machines, Classification Trees and probabilistic LVQ classifier.

In the paper entitled "Learning temperature dynamics on agar-based phantom tissue surface during single point CO<sub>2</sub> laser exposure", by Diego Pardo et al. the main goal is to find mechanisms for temperature prediction compatible with, and straightforward to scale to, existing assistance technologies, for the problem of superficial tissue temperature dynamics during continuous wave CO<sub>2</sub> laser irradiation. The paper is based on statistical learning approach to infer a model that otherwise is not straightforward to obtain or to use in a surgical setup as the one required in laser phonomicrosurgery.

The paper "Towards robust neural-network-based sensor and actuator fault diagnosis: Application to a tunnel furnace", by Marcin Stefan Witczak et al. presents a novel approach for designing both sensor and actuator fault diagnosis with neural networks using a general scheme of the group method of data handling neural networks. The methodology is based on Kalman filter approach for designing the network and determining its uncertainty.

Amparo Alonso-Betanzos et al. in the contribution entitled "An agent-based model for simulating environmental behavior in an educational organization" present an Agent-based modeling of environmental decisions in an academic organization. For the development of the decision-making system for the agents and the social network, data obtained by responses of individuals of the organization to a questionnaire are used, based on decision trees. Regarding

the social network, two methodologies are analyzed: the hierarchical relationships (vertical network), and the relations of friendship and companionship (horizontal network).

In the paper entitled: “On the Design of Robust Linear Pattern Classifiers based on M-Estimators” by Guilherme Barreto et al. the authors present an efficient extensions of OLAM and Adaline, named Robust OLAM (ROLAM) and Robust Adaline (Radaline), which is able to properly classify, even if labeling errors (outlier) exist in the data-base. To deal with such outliers, the ROLAM and the Radaline use Mestimators to compute the weights of the OLAM and Adaline networks, instead of using standard OLS/LMS algorithms. Using synthetic and real-world data sets, authors show that by a very simple change in the learning rules, the classifiers become robust to label noise. The experiments with the synthetic 2D visualize the change in the position of the decision lines as a function of the presence of outliers. The proposed method is a robust linear classifiers consistently outperforms their original versions.

The paper, presented by Rafael Arney et al. “Ant Colony Optimization inspired algorithm for 3D object segmentation in its constituent parts” proposes a new technique based on artificial ant colonies to efficiently handle 3D image segmentation. The main goal of the presented methodology is to segment objects into coherent regions (the segmented regions must represent distinguishable parts of an object). These parts have to be detectable even across variations in the point of view.

Finally, the last selected paper entitled “Neighborhood Guided Smoothed Emphasis for Real Adaboost Ensembles”, by Anas Ahachad et al. presents a simple and robust modification of the Real Adaboost (RA) emphasis procedure, which is based on merging the emphasis value of each sample with those of its  $K$  nearest neighbors in a convex manner. Experimental results in twelve binary benchmark problems confirm the potential of the presented modification by itself and also when combined with a previously tested mixed emphasis algorithm.

The Guest Editors would like to express their gratitude to all the people who supported them in the compilation of this special issue, and specially to the contributing authors for their submissions and to the anonymous reviewers for their comments and useful suggestions in order to improve the quality of the papers.

They would also like to express their gratitude to Editors-in-Chief M. Verleysen and M.H. Hassoun, for providing us with the opportunity to publish this set of selected papers in the present issue. It is a pleasure for us to invite all authors and interested readers of this issue to future IWANN conferences, which will be announced at <http://iwann.ugr.es>.