



Editor

Xiaodong Zhuang



Advances in Computational Intelligence

- **Proceedings of the 16th International Conference on Fuzzy Systems (FS '15)**
- **Proceedings of the 16th International Conference on Neural Networks (NN '15)**

Rome, Italy, November 7-9, 2015



ADVANCES in COMPUTATIONAL INTELLIGENCE

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Preface

This year the 16th International Conference on Fuzzy Systems (FS '15) and the 16th International Conference on Neural Networks (NN '15) were held in Rome, Italy, November 7-9, 2015. The conferences provided a platform to discuss mathematical foundation of fuzzy logic, fuzzy algorithms, fuzzy expert systems, neural-fuzzy systems, software engineering for fuzzy systems, architectures of neural networks, neural network software, machine learning, mixed implementation of neural networks, neural control etc. with participants from all over the world, both from academia and from industry.

Their success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of these conferences are published in this Book that will be sent to international indexes. They will be also available in the E-Library of the WSEAS. Extended versions of the best papers will be promoted to many Journals for further evaluation.

Conferences such as these can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

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Plenary Lecture 1

On Efficient New Schemes for Optimal Integration of Pattern Classifiers Based on Similarity Analysis of Robust Hierarchical Features



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Abstract: In pattern recognition applications the features are extracted using a Feature Extraction Method (FEM), which produces a suitable set of features of the desired pattern, according to the requirements of each particular application. The selection of the appropriate FEM for a considered application depends on the specific conditions and requirements, in order to achieve the higher classification efficiency. To this end, it is essential in demanding applications to use a combination of different FEMs involving efficient cooperation and mixture schemes. The underlying idea is that multiple FEMs contribute different features of the same pattern that correspond to different levels of importance, conveying different important information.

After a critical overview of pattern classifiers mixture approaches, this plenary speech aims at outlining a novel methodology for combining the classification decisions of different neural network as well as different pattern recognition techniques. Instead of the usual approach for applying voting schemes on the decisions of their output layer neurons, the proposed methodology integrates robust higher order features extracted by their upper hidden layer units. More specifically, different instances (cases) of each such classifier, derived from the same training process but with different training parameters, are investigated in terms of their higher order features, through similarity analysis, in order to find out repeated and stable higher order features. Then, all such higher order features are integrated through a second stage neural network classifier having as inputs suitable similarity features of them. The herein suggested hierarchical neural system for pattern recognition shows improved classification performance in computer vision tasks. The validity of this novel combination approach has been investigated when the first stage neural classifiers involved correspond to different Feature Extraction Methodologies (FEM) for shape classification. The experimental study illustrates that such an approach, integrating robust higher order features through similarity analysis of a committee of the same classifier instances (cases) and a second stage neural classifier, outperforms other combination methods, like voting combination schemes as well as single neural network classifiers having as inputs all FEMs derived features. In addition, it outperforms hierarchical combination methods non performing integration of cases through similarity analysis.

Brief Biography of the Speaker: Dimitrios A. Karras received his Diploma and M.Sc. Degree in Electrical and Electronic Engineering from the National Technical University of Athens, Greece in 1985 and the Ph. Degree in Electrical Engineering, from the National Technical University of Athens, Greece in 1995, with honours. From 1990 and up to 2004 he collaborated as visiting professor and researcher with several universities and research institutes in Greece. Since 2004, after his election, he has been with the Sterea Hellas Institute of Technology, Automation Dept., Greece as associate professor in Digital Systems and Signal Processing as well as with the Hellenic Open University, Dept. Informatics as a visiting professor in Communication Systems (the latter since 2002 and up to 2010). He has published more than 65 research refereed journal papers in various areas of pattern recognition, image/signal processing and neural networks as well as in bioinformatics and more than 170 research papers in International refereed scientific Conferences. His research interests span the fields of pattern recognition and neural networks, image and signal processing, image and signal systems, biomedical systems, communications, networking and security. He has served as program committee member in many international conferences, as well as program chair and general chair in several international workshops and conferences in the fields of signal, image, communication and automation systems. He is, also, editor in chief of the International Journal in Signal and Imaging Systems Engineering (JSISE), academic editor in the TWSJ, ISRN Communications and the Applied Mathematics Hindawi journals as well as associate editor in various scientific journals. He has been cited in more than 1300 research papers, his H/G-indices are 16/27 (Google Scholar) and his Erdos number is 5. His RG score is 29.39 (https://www.researchgate.net/profile/Dimitrios_Karras2/)

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