Editorial
Advances in artificial neural networks, machine learning, and computational intelligence (ESANN 2013)

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This special issue of Neurocomputing presents N original articles, which are extended versions of selected papers from the 21st European Symposium on Artificial Neural Networks (ESANN).

ESANN is a single-track conference held annually in Bruges, Belgium, one of the most beautiful medieval towns in Europe, whose atmosphere favours efficient work as well as enjoyable cultural activities (Bruges is a UNESCO World Heritage site).

ESANN is organized by Prof. Michel Verleysen from Université Catholique de Louvain, Belgium. The conference hosts a series of regular sessions about classification, clustering, recurrent networks, regression and forecasting, dimensionality reduction and feature selection, control and optimisation, etc. In addition, ESANN also welcomed in 2013 a few special sessions focused on more particular topics like processing and analysis of hyperspectral data, machine learning for multimedia applications, developments in kernel design, human activity and motion disorder recognition (towards smarter interactive cognitive environments, and sparsity for interpretation and visualisation in inference models.

The contributions in this special issue show that ESANN covers a broad range of topics in neural computation, machine learning, and neuroscience from theoretical aspects to state-of-the-art applications and many related themes in signal processing and computational intelligence. About 130 researcher from more than 15 countries participated in the 21th ESANN in April, 2013. They presented 99 contributions, out of 125 submissions, and enjoyed the especially communicative atmosphere in Bruges. Based on the recommendations of special-session organizers, the reviews of the conference papers, and the quality of the presentations made at the conference, a number of authors were invited to submit an extended version of their conference paper for this special issue of Neurocomputing. All of these articles were thoroughly reviewed once more by at least two independent experts and, finally the N articles presented in this volume were accepted for publication.

In this special issue we can find a multitude of examples using neuro-computing and related techniques in different branches of research.

The paper *Correlation-based embedding of pairwise score data* by Strickert,

Bunte, Schleif, and Hüllermeier deals with dimensionality reduction and data visualization. The proposed method embeds data such that proximity relationships in the low-dimensional space maximally correlate with the corresponding relationships in the high-dimensional space. The latter can be asymmetric and/or incomplete. In addition to Spearman correlation, the authors also investigate soft versions of Spearman and Kendall correlation. The method can be related to both nonmetric multidimensional scaling and (variants of) stochastic neighbor embedding.

In *Decoding stimulation intensity from evoked ECoG activity*, Armin, Naros, Spüler, Gharabaghi, Rosenstiel, and Bogdan study evoked responses to cortical stimulation. The authors focus on the response sensitivity to changes in stimulation parameters. They use regression analysis to train models that infer the stimulation intensity from the shape of the evoked activity. Their experiment show that the models can capture this relationship and generalize to intensities not used during the training process.

The contribution *Training and Making Calculations with Mixed Order Hyper-Networks* by Swingler and Smith describe the properties of neural networks with mixed-order weights. In particular, the authors show that these properties increase the network interpretability, in the sense that the relationships amongst variables can be made explicit in a way that architectures such as the multi-layer perceptron do not.

In *Perceptual Grouping through Competition in Coupled Oscillator Networks*, Meier, Haschke, and Ritter present a novel approach to modelling perceptual grouping. The authors actually transfer the grouping concept from the Competitive Layer Model (CLM) to a network of Kuramoto oscillators. Thereby they preserve the CLM capabilities while improving convergence rate, noise robustness, and computational performance, as shown experimentally.

The article *Neural Learning of Vector Fields for Encoding Stable Dynamical Systems* by Lemme, Neumann, Reinhart and Steil considers the automatic learning of vector fields from dynamic data sets. This is a relevant problem in computer vision to estimate the optical flow or in robotics to calculate force fields in motor control. The problem is especially challenging due to the sparsity of the training data. Lemme et al. employ the Lyapunovs stability theory to address this issue and present an elegant method to estimate the vector fields of sparse dynamic data within a neural network learning approach.

In *A convex formulation for informed source separation in the single channel setting* the authors, A. Lefevre, F. Glineur and P.-A. Absil, approach the problem of blind source separation for audio signals if partial prior segmentation is taken into account as auxiliary information. The problem is formulated as a convex optimization problem with nonnegativity constraints for which effective subgradient techniques can be applied. Application examples of the approach are given for multiple audio data sets.

The paper *Least-Squares Temporal Difference Learning based on Extreme Learning Machine* proposed by P. Escandell-Montero, J. Martinez-Martinez, J. D. Martin-Guerrero, E. Soria-Olivas and J. Gomez-Sanchis is an interesting work in the line of reinforcement learning. The value function is determined

by a novel least squares temporal difference learning algorithm employing the extreme learning machine.

The contributions in this issue cover a broad variety of topics, but also clearly show some trends in the current Neurocomputing research: many approaches try to provide a better understanding of novel models regarding the dynamic, theoretical properties, the combination of techniques or the better interpretation of the learning system behavior or its outcome. There is also a consistent trend towards further domain driven new model extensions, e.g. dedicated algorithms for functional data and complex/structured data or to access new applications. Also substantial research activity is dedicated to the optimizations of known machine learning techniques by means of convergence speed or an improved processing of huge data sets, as such data sets are becoming more and more available in disciplines such as medicine and biology.

The guest editors thank all authors for their submissions and the reviewers for their commitment. Both authors and reviewers have been asked to follow a very tight schedule that has allowed this issue to appear less than a year after the conference, just before ESANN 2014. We also thank the Editorial Board of Neurocomputing for giving us the opportunity to guest-edit this issue, and Elsevier for the very efficient and seamless management of the publication procedure.

Hereby we would like to express special thanks to Suganya Selvi and Vera Kamphuis form the Elsevier editorial office. Finally, our most sincere gratitude goes to Prof. Michel Verleysen for his strong commitment in the conference organisation, translating into steadily increasing numbers of submissions and participants. It is our pleasure to invite all authors and interested readers of this issue to future ESANN conferences, announced on `http://www.esann.org`.

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