



Preface

Welcome to the Special Issue of *Elsevier Neural Networks*, which comprises selected articles from the 17th International Conference on Artificial Neural Networks (ICANN), held in Porto, Portugal, 9–13 September 2007. The conference was organized by the Biomedical Engineering Institute (INEB – Instituto de Engenharia Biomédica), Porto, with the collaboration of the University of Beira Interior (UBI – Universidade da Beira Interior), Covilhã, Portugal and ISEP, Polytechnic Engineering School, Porto, Portugal. Joaquim Marquez de Sa (University of Porto), and Luis Alexander (University of Beira Interior) acted as general co-chairs, while John G. Taylor (Kings College, London), was a honorary chair of this conference. Editors of this special issue, Danilo Mandic (Imperial College London), and Włodek Duch (Nicolaus Copernicus University, Toruń, Poland) served as the program co-chairs.

The ICANN series of conferences have been organized annually by the European Neural Network Society (ENNS, <http://www.enns.org>), in co-operation with the International Neural Network Society, the Japanese Neural Network Society, and recently with the IEEE Computational Intelligence Society, in different European countries since 1991. These are medium size conferences (about 250 participants each year), focused on all aspects of neural networks research, from computational neuroscience to neural network applications. ENNS sees its role as an umbrella organization for national neural network societies, coordination of various European activities in this field, and is one of the three societies that are responsible for the *Neural Networks* journal. Up to 20 students each year receive ENNS stipends to attend ICANN.

There were 376 papers submitted to the conference. The quality of the papers received was very high, and 197 of them were selected for presentation and publication in the Springer Lecture Notes in Computer Science (Vol. 4668 and 4669). Based on the peer reviews, we have selected nine papers, rewritten and substantially extended, for this special issue. The selected articles span a wide range of neural network theories and applications, from multidimensional and multimodal systems to spiking neurons and hardware implementation. We believe that the selected papers illustrate the diversity and depth in modern neural networks research.

The paper “Deterministic neural dynamics transmitted through neural networks”, by Yoshiyuki Asai, Apratim Guha and Alessandro Villa addresses spatiotemporal sequences of neuronal discharges, showing that cells with subthreshold oscillations (resonators) are very sensitive to stochastic inputs and that cortical regular-spiking neurons can propagate filtered temporal information in a reliable way through the network.

The article entitled “Imprecise Correlated Activity in Self-Organizing Maps of Spiking Neurons”, by Francisco J. Veredas, Héctor Mesa, and Luis A Martínez considers integrate-and-fire

neural networks and analyzes how changes in the precision of correlated firing among neurons affect self-organization. They show that by keeping these changes within biologically realistic ranges, orientation selectivity maps can emerge and the features of neuronal receptive fields are significantly affected.

The third paper in this special issue is entitled “A Theoretical Study of Multisensory Integration in the Superior Colliculus by a Neural Network Model”, by Elisa Magosso, Cristiano Cuppini, Andrea Serino, Giuseppe Di Pellegrino, and Mauro Ursino. They present a mathematical model of the integrative response of SC neurons and provide a deeper insight into the individual differences in integrative abilities. Their model is shown to be able to mimic various responses described in the literature.

Simon McGregor, in his article “Further Results in Multiset Processing with Neural Networks”, presents new experimental results on the variadic neural network, whose inputs are an arbitrary-length list of n-tuples of real numbers. This paper describes improvements in the training algorithm for the variadic perceptron, based on a constructive cascade topology, and performance of the improved networks on geometric problems inspired by vector graphics.

In the paper “Iterative Principles of Recognition in Probabilistic Neural Networks”, Jiri Grim and Jan Hora consider a probabilistic approach to neural networks in the framework of statistical pattern recognition. By introducing iterative schemes of recognition, they show that some parameters of probabilistic neural networks can be “released” for the sake of dynamic processes without disturbing the statistically correct decision making.

In the next article, two forms of immediate reward reinforcement learning for exploratory data analysis, are proposed by Colin Fyfe, Ying Wu, and PeiLing Lai. They investigate several new learning rules to perform linear projection techniques such as principal component analysis, exploratory projection pursuit and canonical correlation analysis. The method is shown to be general and to be able to be used in learn kernel mappings and topology preserving mappings.

The seventh paper in this special issue is entitled “Combining Experts In Order to Identify Binding Sites in Yeast and Mouse Genomic Data”, by Mark Robinson, Cristina González Castellano, Faisal Rezwan, Rod Adams, Neil Davey and Yi Sun. They use an SVM together with data sampling to classify the combination of the results of specialized individual algorithms. The resulting classifier produces fewer false positive predictions and so reduces the expensive experimental procedure of verifying the predictions.

In the paper entitled “Event detection and localization for small mobile robots using reservoir computing”, by Eric A Antonelo, Benjamin Schrauwen, and Dirk Stroobandt, reservoir computing techniques are used for detecting complex events in autonomous

robot navigation. These techniques are demonstrated in both a simple simulation environment, and in the physically realistic Webots simulation of the commercially available e-puck robot, using several complex and even dynamic environments.

Finally, FPGA Implementation of a stochastic neural network is addressed by Giuliano Grossi and Federico Pedersini. This allows them to obtain high computation speed by exploiting parallelism, as the neuron update and the constraint violation check can be performed in parallel over the whole network. The developed architecture is shown to provide dramatically faster computation, with respect to the software implementation, even adopting a low-cost FPGA chip.

We would like to thank the authors for their contributions and the reviewers for their efforts to ensure the quality of this special issue. We would also like to thank the organisers of ICANN 2007, Joaquim Marquez de Sa (University of Porto), and Luís Alexandre

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