

Editorial

The Brazilian Symposium on Neural Networks (SBRN'04)

This Special Issue presents articles selected from the VIII Brazilian Symposium on Neural Networks, SBRN'04. The SBRN covers topics related to Artificial Neural Networks, Evolutionary Computation, Fuzzy Systems and other Computational Intelligence Algorithms, accepting papers presenting new theoretical studies and novel applications. In its last editions, the proceedings were published by IEEE Computer Society. It has an international Program Committee, which includes well-known international researchers.

SBRN'2004 took place in the island of São Luís, Brazil, between September 29th and October 1st. It was sponsored by the Brazilian Computer Society (SBC) and co-sponsored by SIG/INNS/Brazil Special Interest Group of the International Neural Networks Society in Brazil. SBRN'04 received 329 submissions from Brazil and abroad. Among these submissions, 154 full papers were accepted, and 103 were orally presented. The authors of the papers with the best reviews were invited to submit an extended and updated version for this special issue. The selection process took into account the originality, relevance and technical contribution.

The new versions were submitted to a rigorous peer review process conducted by international reviewers. Only the papers recommended by the reviewers were accepted for this special issue. In the end of this new review process, nine papers were selected. We believe that this issue presents a set of valuable papers reporting very high quality work. It will provide the readers a rich material of current research on Artificial Neural networks, Evolutionary Computation and related issues.

The accepted papers include both theoretical and application research works from very diverse areas, such as biological neural network modeling, reinforcement learning, signal processing, cellular automata, adaptive filters, hybrid neural networks and evolutionary algorithms. Next, we briefly comment the topics covered by the published papers.

In the first article, *A Computational Model of Classical Conditioning in the Primary Auditory Cortex*, the authors propose a biologically plausible computational model of the primary auditory cortex and the pre-cortical structures related with auditory processing able to reproduce a number of properties of tonotopic maps in this region.

The authors employ the model to simulate a classical conditioning experiment that retunes specific neurons to the conditioned frequency.

The second paper, related to signal processing, investigates a class of algorithms for adaptive filtering based on non-linear cost function of the error, a generalization of the least mean square algorithm. In this article, called *Non-linear Even Functions for Error Minimization*, the authors analyze the convergence properties of the proposed algorithms and compare their performance with similar algorithms proposed in the literature.

Next, the readers will find two papers on reinforcement learning. The first of these, *Reinforcement Learning of a Simple Control Task Using the Spike Response Model*, works with spiking neurons through a variation of the classical reinforcement learning algorithm based on the spike response model. The proposed model was evaluated in a control application. The results obtained are compared to those obtained by traditional methods based on function approximation and temporal differences.

The second work on reinforcement learning, reported in the paper *Influence Zones: A Strategy of Enhancing Reinforcement Learning*, presents a way in which reinforcement learning can be modified to handle large size problems by allowing value updating of several states and state-actions at each interaction. The influence zone algorithm, which improves the topological reinforcement learning agent strategy, allows the reduction of the number of requested interactions. Its performance is compared against several other reinforcement learning algorithms.

The next two papers cover hybrid systems using evolutionary algorithms. The first one, *The Best Currently Known Class of Dynamically Equivalent Cellular Automata Rules for Density Classification*, shows how the use of a multi-objective evolutionary algorithm can improve the search for high quality binary cellular automata rules. The performance of the rules obtained by different algorithms are evaluated in a density classification task.

The other paper describing a hybrid system, *Use of Gene Dependent Mutation Probability in Evolutionary Neural Networks for Non-Stationary Problems*, proposes a new evolutionary algorithm for non-stationary problems. For such, this algorithm uses gene dependent mutation probabilities. This algorithm was used to optimize the free

parameter of an artificial neural network in applications where the probability distribution of the data may change with time.

The last three papers present applications of neural networks and evolutionary algorithms to real world problems. The first of these, *Determination of Multiple Direction of Arrival in Antennas Arrays with Radial Basis Functions*, shows how a modular neural model based on radial basis function can be used, together with blind source separation, for the detection of multiple signals simultaneously arriving on antenna arrays. According to the authors, the proposed model can separate mixed signals without a priori information.

The second application, *Improving Self Organization of Document Collections by Semantic Mapping*, is a work on text mining where the authors propose a method for feature extraction, named semantic mapping, which is a specialization of the sparse random mapping method. The main difference is the incorporation of semantics of the features extracted. The authors compare the performance of the proposed method with sparse random mapping and PCA.

The last paper in this special issue, *Combining an Evolutionary Algorithm with Data Mining to Solve a Vehicle Routing Problem*, describes how the performance of a genetic algorithm can be improved by the inclusion of local

search and data mining modules. The authors investigate different variations (without the modules, with each one of the modules and with both modules) in a special version of the vehicle routing problem.

The editors would like to thank all the authors for the high quality of their papers, the referees for their careful reviews with useful comments and suggestions that improved the quality of this special issue. Thanks also to the *Neurocomputing* Editor, Tom Heskes, the Journal Editorial Board and Elsevier for the opportunity and very efficient handling of the publication procedure. We would further like to thank Ms Vera Kamphuis for the careful edition of this issue.

Guest Editors

Aluizio F.R. Araújo

Federal University of Pernambuco, Brazil

E-mail address: aluizioa@cin.ufpe.br

André de Carvalho

University of São Paulo, Brazil

E-mail address: andre@icmc.usp.br