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EDITORIAL

Hybrid artificial neural network

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Artificial neural networks (ANNs) or simply neural networks (NNs) are now a consolidated technique in computational intelligence. They consist of interconnected cells, called neurons, and simulate the behavior of the biological neural network in a human brain. For that purpose, ANNs use a statistical non-linear computational model. Neural networks are generally used to model complex relationships between inputs and outputs or to classify data finding common patterns.

Computationally speaking, the model behind neural networks needs heavy efforts and therefore researchers are always trying to find a way to perform the neural process efficiently. One valid attempt to improve this process consists of hybridizing other techniques of computational intelligence with neural networks. This special issue is devoted to research papers on hybrid artificial neural network. Evolutionary computation, fuzzy logic, ant colony as well as hardware implementation are considered in the articles of this special issue of the ''International Journal of Neural Computing and applications—JNCA''. In the following, we outline the contribution of each included paper.

In the first paper, entitled ''Using evolution to improve neural network learning: pitfalls and solutions'', J. Boulinaria shows that a range of evolutionary techniques can generate high performance networks. However, theses techniques often lead to unwanted side effects, such as occasional instances of very poor performance. The nature of these problems is explored further, and it is shown how the evolution of age dependent plasticities and/or the use of ensemble techniques can alleviate them.

In the second paper, entitled ''RRS + LS – SVM: a new strategy for a priori sample selection'', B. P. R. de Carvalho, W. S. Lacerda and A. P. Braga propose a new sparse hybrid classifier, using reduced remaining subset (RRS) with least squares support vector machine (LS-SVM). The new hybrid classifier is considered sparse because it is able to detect support vectors, which is not possible with LS-SVM separately. Some experiments are presented to compare the proposed approach against existent methods that also aim to impose sparseness in LS-SVMs.

In the third paper, entitled ''An ant colony optimization algorithm for continuous optimization: application to feed-forward neural network training'', K. Socha and C. Blum focus on the training of feed-forward neural networks for pattern classification to test the efficiency and practicality of continuous ant colony optimization. They also propose hybrid algorithm variants that incorporate short runs of classical gradient techniques such as back-propagation. The results show that the best of our algorithms are comparable with gradient-based algorithms for neural network training and our algorithms compare favorably with a basic genetic algorithm.

In the fourth paper, entitled ''Reconfigurable hardware for neural networks: binary vs. stochastic'', N. Nedjah and L. M. Mourelle propose a reconfigurable, low-cost and readily available hardware architecture for an artificial neuron. As the state-of-the-art FPGAs still lack the gate density necessary for the implementation of large neural networks of thousands of neurons, we use a stochastic process to implement

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efficiently the computation performed by a neuron. The results are very promising.

In the fifth paper, entitled ''Transferring neural network based knowledge into an exemplar-based learner'', M. C. Nicoletti, L. B. Figueira and E. R. Hruschka Jr investigate knowledge transfer from a neural network based system into an exemplar-based learning system. In order to examine the possibilities of such transfer, they propose and evaluate a system that implements a collaborative scheme, where a particular type of neural network induced by the neural system RuleNet is used by an exemplar-based system to carry on a learning task.

In the sixth paper, entitled ''Learning with partly labeled data'', A. Bouchachia outlines the two main classes of learning methods to deal with partly labeled data: pre-labeling based learning and semi-supervised learning. Concretely, he introduces and discusses three methods from each class, which compare very well with the state-of-art methods.

In the seventh paper, entitled ''A data reduction approach for resolving the imbalanced data issue in functional genomics'', K. Yoon and S. Kwek propose preprocessing training imbalanced data by partitioning them into clusters. This greatly reduces the imbalance between minority and majority instances in each cluster. For moderate imbalance ratio, their technique gives better prediction accuracy than other re-sampling method. For extreme imbalance ratio, this technique serves as a good filter that reduces the amount of imbalance so that traditional classification techniques can be deployed.

In the last paper, entitled ''Ensemble of hybrid neural network learning approaches for designing pharmaceutical drugs'', A. Abraham and C. Grosan propose an ensemble of three learning algorithms namely an evolutionary artificial neural network, Takagi–Sugeno neuro-fuzzy system and an artificial neural network to solve the problem of parameter selection in drug design process. Experiment results indicate that the proposed methods are efficient.

The editors wish to thank the referees who have critically evaluated the papers within the short stipulated time. Finally, we hope that the reader will share our joy and excitement to find this special issue useful and enlightening. We would like to take this opportunity to thanks Professor J. MacIntyre, the Editor-in-chief of ''International Journal of Neural Computing and Applications'' for all the timely advices and help and also for the opportunity for editing this important scientific work.

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