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EDITORIAL

Guest editorial: Special issue on Extreme learning machine and applications (II)

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It is our great pleasure to present this special issue on Extreme learning machine (ELM) and applications (II) to all NCA readers and neural computing society. Our initial schedule was to publish the special issue on ELM and applications with about 15 articles and to report the recent development of ELM theory and applications as well as the challenges in designing, analysing and implementing the algorithms and systems. However, after rigorously reviewing all of received papers on the basis of innovativeness and relevance for all NCA readers, we realized that many of them were high quality and finally selected 30 top papers. After getting the permission from Editor-in-Chief, Professor John MacIntyre, we are very happy to present these selected top papers in two special issues. The following is the brief introduction of 15 articles in the special issue: Extreme Learning Machine and Applications (II).

In "*Fault detection and diagnosis method for batch process based on ELM-based fault feature phase identification*", the authors propose a fault detection and diagnosis algorithm for batch processes with ELM methodology. In this work, ELM is first utilized to identify the feature phases for each fault, and the whole batch is divided into a few "short stages". The multiway Fisher discriminant analysis (MFDA) models are then built for these divided "short stages" to perform fault detection and diagnosis for a batch process. The simulation results have shown the excellent performance of the algorithm for the fault detection in a hydrostatic testing process. In "*Multiple-kernel-learning-based extreme learning machine for classification design*", the authors develop two multiple kernel classifiers. The first one is based on a convex combination of the given base kernels, while the second one uses a convex combination of the so-called equivalent kernels. Experimental results have shown that, for a large number of data sets, the proposed classifiers are fast, accurate and easily trained. In "*Variational Bayesian extreme learning machine*", the authors present a Bayesian probabilistic model based on ELM to avoid the ill-posed problem in input–hidden node matrix. Both the regression experiments and classification experiments have clearly shown the excellent performance compared with a few existing ELM-based schemes. In "*A recurrent neural network for modelling crack growth of aluminium alloy*", the authors develop a new recurrent neural model for crack growth process of aluminium alloy. It has been shown that a recurrent neural network with the feedback loops at the output layer is constructed to model the dynamic relationship between the crack growth and cyclic stress excitations of aluminium alloy. The extreme learning machine is then used to uniformly randomly assign the input weights in a proper range and globally optimize both the output weights and feedback parameters, to ensure that the dynamics of crack growth under variable amplitude loading can be accurately modelled. The simulations with experimental data have shown excellent results.

In "*Extend semi-supervised ELM and a frame work*", the authors analyse the semi-supervised ELM (SELM) in-depth and propose an extended SELM algorithm that can efficiently solve the classification problems with a small number of labelled samples. The simulation results have shown excellent classification performance compared with both ELM and SELM algorithms. In "*Feature adaptive online sequential extreme learning machine for lifelong*

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indoor localization", the authors present a feature adaptive online sequential ELM (FA-OSELM) algorithm. The advantage is that it can transfer the original model to a new one with a small number of principle features in the sense that the features can be easily classified. The experiments with four different Wi-Fi location data sets have shown that the FA-OSELM algorithm has an excellent classification performance. In "*Breast tumor detection in double views mammography based on extreme learning machine*", the authors develop an optimized fused feature model by using the features of both single views and double views. Then, a CAD detection method based on ELM is proposed for improving the effectiveness of breast tumour detection. The effectiveness of the algorithm has been confirmed with the experimental data. In "*A modified ELM algorithm for the prediction of silicon content in hot metal*", the authors present a soft-sensing modelling method based on a modified ELM to perform the prediction of silicon contentment in hot metals. In the simulation, the real data collected from a blast furnace in factory are applied and tested with the results that the proposed prediction model has less error than the other existing ones such as BP and support vector methods.

In "*Manifold regularized extreme learning machine*", the authors discuss the relationship between the extended manifold regularization (MR) framework and ELM and then derive a manifold regularized ELM. The proposed algorithm can not only maintain the properties of ELM, but also be applicable to large-scale learning problems. Experimental results show that the proposed algorithm is the most cost-efficient method. In "*Efficient relation extraction method based on spatial feature using ELM*", the authors extend ELM to MR-ELM algorithm, which can be used for classification and regression with labelled and unlabelled examples available. Experiments on real-world data sets have verified the theoretical analysis and effectiveness of the algorithm. In "*An optimal method for data clustering*", the authors present an algorithm for optimizing data clustering in feature space by using graph Laplacian and ELM. It is shown that the algorithm explicitly performs a mapping of the original data for clustering into an optimal feature space to further increase the separability of original data. The effectiveness of the algorithm is confirmed by the experimental results.

In "*Self-adaptive extreme learning machine*", the authors combine the self-adaptive mechanism with ELM to develop a new algorithm that can always select the best neuron number in hidden layer to construct the neural networks. The new algorithm has been used to solve the Italian wine and iris classification problems with excellent performance. In "*HSR: $L_{1/2}$-regularized sparse representation for fast face recognition using hierarchical feature selection*", the authors propose a novel method for fast face recognition by employing hierarchical feature selection and compressing the scale and dimension of global dictionary. The algorithm is capable of largely reducing the computational cost in sparse representation. The algorithm has been compared with a few existing ones to demonstrate its excellent performance in face recognition. In "*Real-time transient stability status prediction using cost-sensitive extreme learning machine*", the authors present a new real-time transient stability status prediction algorithm based on ELM for electrical power systems. The algorithm is able to minimize both the total misclassification costs and false dismissal rate with low computational complexity. The simulation results with the New England 39-bus electrical power system model have shown the good prediction performance. A few minor typing errors in this article are clarified in the short note entitled "*Erratum to: Real-time transient stability status prediction using cost-sensitive extreme learning machine*".

Overall, we hope that the readers will enjoy reading the papers in this special issue. And we are confident that this special issue will provide new inputs for the readers who are working in neural network-based information processing as well as for those who are interested in the new development of ELM. Many thanks also go to all of authors, reviewers, Editor-in-Chief as well as Springer Journals Production editor for their efforts in making the special issues possible.