

Special issue on the engineering applications of neural networks

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The Engineering Applications of Neural Networks (EANN) conferences are organised annually, and they are technically supported by the INNS (EANN Special Interest Group). They promote neural networks and associated techniques and the significant benefits that can be derived from their use. The conferences are not only for reporting advances, but also for showing how artificial neural networks (ANN) and other soft computing approaches provide practical solutions in a wide range of applications.

Several contributions were selected from the 15th EANN 2014 conference (held in Sofia Bulgaria) for potential inclusion in this special issue. Each one of them has passed through a peer-review process by independent academic referees. This special issue includes the nine ones that were finally accepted to be published. These nine papers explore modelling approaches, employing diverse Computational Intelligence techniques such as multilayer feedforward ANN, recurrent and probabilistic ANN, fuzzy logic and support vector machines. On the other hand, novel methods are proposed and applied to a wide range of real-world problems.

More specifically: In the paper “Unsupervised feature selection for sensor time-series in pervasive computing applications”, Bacciu investigates a novel feature selection approach for multivariate time series (MTS) of heterogeneous sensor data. He introduces incremental cross-correlation filter algorithm for unsupervised feature subset

selection on MTS of sensor data. The performance of the proposed method is compared with the performance of other state-of-the-art unsupervised feature filters for time series. Real-world data related to mobile robot navigation and to human activity recognition are used in the experiments.

An intelligent model based on recurrent neural networks with nonlinear autoregressive architecture is applied for the enhancement of hybrid renewable energy systems control in the paper of Chatziagorakis et al. The authors report promising results for the prediction of daily and hourly solar radiation and wind speed, which are essential for optimising power management strategies of hybrid renewable energy systems.

The paper by Onoda evaluates probabilistic models for intrusion detection, using the sequence characteristics of network traffic in the control system communication. The author compares a hidden Markov model (HMM) and a conditional random field (CRF) with one-class support vector machine (SVM), support vector data description and rule-based intrusion detection method. The proposed CRF approach performs better in detecting attacks that deviate from the typical system actions without the need of prior knowledge of attacks.

The paper authored by Furquim et al. is entitled “Improving the accuracy of a flood forecasting model by means of machine learning and chaos theory”. It considers actual river water level and rain height in order to access the risk of flooding, by employing multilayer perceptrons, Elman recurrent neural networks and principles of chaos theory. These modelling approaches are applied on time-series data collected by wireless sensors.

The paper by Ekonomou et al. proposes ANN to perform diagnostics of the condition of the surge arresters in electric utilities. The proposed approach offers an alternative, more

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efficient and accurate methodology compared to the existing simulation methods for the assessment of medium-voltage surge.

A novel automatic screening system for diabetic retinopathy that focuses on the detection of the earliest visible signs of retinopathy is proposed in the paper of Srani et al. entitled “Automatic detection of microaneurysms in colour fundus images for diabetic retinopathy screening”. A number of feature extraction methods are utilised including circular Hough transform and a fuzzy histogram equalisation method in the detection of microaneurysms.

The paper authored by Malcangi suggests a novel fuzzy logic-based system for sleep-onset prediction during driving a vehicle. He applies effectively a sensor-data fusion method and an evolutionary fuzzy neural network to imprecise data. The proposed approach can effectively model the knowledge from the physiological and behavioural information collected from the driver and adapt to different drivers and different driving conditions due to its evolving capability.

Another application of fuzzy logic systems can be found in the paper of de Aguiar et al. “A fuzzy logic system

trained by conjugate gradient methods for fault classification in a switch machine”. The authors explore the use of signal processing and computational intelligence techniques in the classification of faults in electromechanical switch machine, which is equipment used for handling railroad switches. The proposed techniques are evaluated on real-life measured data.

The paper by Bougoudis et al. considers an innovative ensemble learning modelling approach based on the combination of unsupervised clustering ANN and random forest ensembles and fuzzy logic. It is entitled “HISYCOL a hybrid computational intelligence system for combined machine learning: the case of air pollution modeling in Athens”. The proposed hybrid method is evaluated on real data collected in the Attica basin for prediction of air pollutant values. The results show that the proposed hybrid approach can provide reliable and valid predictions.

We hope that the readers will find these papers interesting and that further pursuits will be stimulated in applied neurocomputing. The guest editors wish to thank all the authors and reviewers that contributed to this special issue and to the editor-in-chief and editorial office of the Neural Computing and Application journal for their support.