Guest editorial

Special issue on evolving solution with neural networks

Artificial neural networks (ANNs) have been recognized as powerful and economical tools to solve a large variety of problems in a number of scientific disciplines, and represent a consolidated paradigm for many engineering problems, due to their ability to model highly nonlinear systems, even when process understanding is limited. Furthermore, when the only available information comes from direct measures of the observable quantities, the sequences of input–output couples can be used to design adaptive models by learning from examples.

ANNs have in fact reached a high degree of maturity strengthened by a huge number of real-world applications. The industrial applications that can be solved with a neural approach cover many sectors related to control, model identification, and prediction of complex systems.

This special issue is directed to present innovative neural methodologies for the solution of industrial and environmental problems. In such a wide range, this special issue of Neurocomputing provides to the general readership just a sample of the state of the art in the field of applications of ANN in engineering domains.

The issue is the result of a selection process of the papers presented at the EANN ’01 (Seventh International Conference on Engineering Application of Neural Networks), held in Cagliari, Italy, in July 2001.

The papers presented to the conference covered various aspects of the neural technologies and the sessions were devoted to the following topics:

- process engineering,
- control,
- forecasting in power systems,
- environmental data processing,
- vision.

Fourteen contributors have been short listed over the papers presented at EANN ’01, and invited to submit an extended version of their papers. Each submitted paper has been thoroughly reviewed by at least three independent referees. After the revision process, nine papers have been accepted for this special issue of Neurocomputing on Evolving Solution with Neural Networks.

The topics covered by the selected papers are: flood level prediction, electrical load forecasting, air pollution, electromagnetic source localization, real-world dynamic systems identification, and audio signal processing.
Baratti et al. present a paper, which proposed a river discharge prediction using the ANN. In this paper two different ANN models are tested, rainfall–runoff model and runoff–runoff prediction model. The ANN model results for different sampling intervals (daily, monthly) and different model structures are presented.

Bazartseren, Hildebrandt and Holz, present a comparative analysis on short-term flood level prediction using ANNs, neuro-fuzzy systems approaches compared to more classical statistical models, namely ARMA and ARMAX models.

The paper of Burrascano et al., concerns the electromagnetic source localization. The authors present a technique based on independent component analysis (ICA), as a part of a feasibility study for electromagnetic pollution monitoring via neural network techniques. Moreover, four ICA algorithms known from the literature are compared to estimate the propagation parameters of electromagnetic fields emitted by radio-base transmission systems.

The paper of Fay et al. presents a comparison of sequential and partitioned time series for 24-h electrical load data problem. The paper examines which approach is appropriate for forecasting hourly electrical load.

The paper of Gerecke et al., presents a new approach for mobile robot localization by a multi-net ensemble technique. This method involves the use of a common evidence vector for all ensemble members and increases the speed of the multi-net ensemble by implicit voting.

The paper of Panella, Rizzi and Martinelli, addresses the problem of the prediction of future values of environmental data sequences. They propose two possible approaches for refining the prediction accuracy on real data sequences. The first approach pursues the regularization of the learning process based on the reconstructed state of the context delivering the sequence; the second one is based on the particular chaotic nature of the prediction error.

The paper of Ruano et al., presents some identification results for the shaft-speed dynamics of an aircraft gas turbine. Two different approaches are considered: NARMAX models, and neural network models, namely multilayer perceptron, radial basis function networks and B-spline networks.

The paper of Tronci et al., analyzes the problems related to the reconstruction of a dynamic system, which exhibits chaotic behaviour, from time series associated with a single observable of the system itself, by using feedforward neural network model.

The paper of Uncini presents a review of architectures suitable for nonlinear real-time audio signal processing. In particular, efficient neural architectures and some applications in the fields of audio signal processing are discussed.

It is expected that some of the papers published in this special issue will become a reference in due time, reflecting their high quality, and will stimulate further investigations in their fields.

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which have helped to significantly improve the quality of the issue.

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