

Reduction of the dimension of neural network models in problems of pattern recognition and forecasting

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Abstract

© Published under licence by IOP Publishing Ltd. Deep neural networks with a large number of parameters are a powerful tool for solving problems of pattern recognition, prediction and classification. Nevertheless, overfitting remains a serious problem in the use of such networks. A method of solving the problem of overfitting is proposed in this article. This method is based on reducing the number of independent parameters of a neural network model using the principal component analysis, and can be implemented using existing libraries of neural computing. The algorithm was tested on the problem of recognition of handwritten symbols from the MNIST database, as well as on the task of predicting time series (rows of the average monthly number of sunspots and series of the Lorentz system were used). It is shown that the application of the principal component analysis enables reducing the number of parameters of the neural network model when the results are good. The average error rate for the recognition of handwritten figures from the MNIST database was 1.12% (which is comparable to the results obtained using the "Deep training" methods), while the number of parameters of the neural network can be reduced to 130 times.

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