I.E. Livieris, T. Kotsilieris, S. Stavroyiannis, P. Pintelas. Forecasting stock price index movement using a constrained deep neural network training algorithm
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Abstract - The prediction of stock index movement is considered a rather significant objective in the financial world, since a reasonably accurate prediction has the possibility of gaining profit in stock exchange, yielding high financial benefits and hedging against market risks. Undoubtedly, the area of financial analysis has been dramatically changed from a rather qualitative science to a more quantitative science which is also based on knowledge extraction from databases. During the last years, deep learning constitutes a significant prediction tool in analyzing and exploiting the knowledge acquired from financial data. In this paper, we propose a new Deep Neural Network (DNN) prediction model for forecasting stock exchange index movement. The proposed DNN is characterized by the application of conditions on the weights in the form of box-constraints, during the training process. The motivation for placing these constraints is focused on defining the weights in the trained network in more uniform way, by restricting them from taking large values in order for all inputs and neurons of the DNN to be efficiently exploited and explored. The training of the new DNN model is performed by a Weight-Constrained Deep Neural Network (WCDNN) training algorithm which exploits the numerical efficiency and very low memory requirements of the L-BFGS (Limited-memory Broyden–Fletcher–Goldfarb–Shanno) matrices together with a gradient-projection strategy for handling the bounds on the weights of the network. The performance evaluation carried out on three popular stock exchange indices, demonstrates the classification efficiency of the proposed algorithm.