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New Machine Learning Optimization Approach Based on Input Variables Disposition Applied for Time Series Prediction

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Abstract : One of the main applications of machine learning is the prediction of time series. But a more accurate prediction requires a more optimal model of machine learning. Several optimization techniques have been developed, but without considering the input variables disposition of the system. Thus, this work aims to present a new machine learning architecture optimization technique based on their optimal input variables disposition. The validations are done on the prediction of wind time series, using data collected in Cameroon. The number of possible dispositions with four input variables is determined, i.e., twenty-four. Each of the dispositions is used to perform the prediction, with the main criteria being the training and prediction performances. The results obtained from a static architecture and a dynamic architecture of neural networks have shown that these performances are a function of the input variable's disposition, and this is in a different way from the architectures. This analysis revealed that it is necessary to take into account the input variable's disposition for the development of a more optimal neural network model. Thus, a new neural network training algorithm is proposed by introducing the search for the optimal input variables disposition in the traditional back-propagation algorithm. The results of the application of this new optimization approach on the two single neural network architectures are compared with the previously obtained results step by step. Moreover, this proposed approach is validated in a collaborative optimization method with a single objective optimization technique, i.e., genetic algorithm back-propagation neural networks. From these comparisons, it is concluded that each proposed model outperforms its traditional model in terms of training and prediction performance of time series. Thus the proposed optimization approach can be useful in improving the accuracy of time series forecasts. This proves that the proposed optimization approach can be useful in improving the accuracy of time series prediction based on machine learning.

Keywords : input variable disposition, machine learning, optimization, performance, time series prediction
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