A Hybrid Deep Neural Network Model to Forecast Day-Ahead Electricity Prices in the USA Energy Market

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A day-ahead electricity price forecasting is a very crucial area of research that focuses on predicting prices in wholesale electricity markets. Although many contributions have been made to the subject of energy price forecasting in the last few years, it is debatable if there is a state-of-the-art method for assessing prediction in the USA energy market. The USA wholesale and retail markets highly appreciate any improvements in accurate forecasts with electricity prices. At the moment, it is clearly noticeable how much more effective renewable energy sources are having at the US power market. In addition, the reproducibility of research, clear view of input features, and inclusion of renewable resources in electricity price forecasting are missing or loosely attempted. In this paper, we tackle these issues by providing a concrete view of input features, data preparation, data normalization, and also high performing VMD-LSTM hybrid deep learning model for forecasting day-ahead prices. The inclusion of renewable input features like temperature data to catch solar energy effects, and wind speed data to capture wind energy effects in electricity prices in the USA market make our model unique. The proposed VMD-LSTM hybrid model with 24 input features shows only 0.2935 mean absolute error with the MISO market data to forecast prices. Unquestionably, in the subject of forecasting electricity prices, the proposed VMD-LSTM model with the given input features setup is a respectable example of a state-of-the-art deep learning model.