Wind power forecasting based on bagging extreme learning machine ensemble model

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Data

- Wind power data from two wind farms in Bahia state, in the northeast of Brazil.
- The sampling rate of the data set was of 6 steps per hour, meaning each step advances 10 minutes in time.

WDF1 is located in São Sebastião do Alto and has an installed capacity of 19.20 megawatt (MW). In turn, the WDF2 is located in Rio Verde and has an installed capacity power of 31.92 MW.

Model



- Model was compared with ANFIS, ELM, CNNs, RNN, LSTM, GRU, NAIVE, THETA, TBATS, ARIMA, XGBoost, RF, KNN, SVR and Stacking.
- RMSE. MAE and MAPE were evaluated for a test set.
- Diebold-Mariano test was performed to evaluate the statistical significance of the error difference.

Results

- Results suggest that the proposed ensemble achieved better forecasting performance than bootstrap stacking, machine learning, artificial neural networks, and statistical models, with values of approximately 12.76%, 25.25%, 31.91%, and 34.76%, respectively, in terms of root mean squared errors reduction for out-of-sample forecasting.
- Using DM test, the proposed model had a difference in the error signal to a significance of 1% with all other tested models.

