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Machine Learning-based Modelling with applications for forecasting regional wind power and air quality index.

Recently, time series forecasting has acquired considerable academic and industrial interests in various areas for different applications. Machine learning (ML) algorithms are known for their ability to capture the chaotic temporal non-linear relations in time-series data. This work considers two different case studies of time-series forecasting: wind power forecasting and air quality index (AQI) forecasting. The wind power prediction problem assesses different ML forecasting algorithms for one-step and multi-step ahead forecasting with and without exogenous predictors. This problem addresses regional forecasting rather than single-site forecasting, investigates the effects of exogenous predictors on the prediction reliability, and considers the multi-step ahead forecasting through multi-input multi-output (MIMO) strategy.

On the other hand, the AQI forecasting problem tackles the issue of missing observation in time-series data by testing different ensemble-based multivariate imputation techniques to investigate their superiority compared to the univariate imputation methodologies. This comparison is verified by building ML AQI forecasting models with datasets imputed by different imputation methodologies. Data pre-processing steps were taken into account for both problems using different benchmarking techniques for feature selection, feature scaling, feature extraction, and dimensionality reduction.

The models' performances were compared based on various performance metrics such as mean absolute error, mean squared error, and others.