Short-term Offshore Wind Speed Forecast by Seasonal ARIMA

Xiaolei Liu[1] and Zi Lin[2]

[1] James Watt School of Engineering, University of Glasgow, Glasgow, G12 8QQ, UK
[2] Department of Mechanical & Construction Engineering, Northumbria University, Newcastle upon Tyne, NE1 8ST, UK

Abstract

For maintaining safe operations of wind farms and providing high-quality power supply to the end customers, it is significant to develop reliable short-term time series wind speed forecasting models. In this study, a Seasonal Auto-Regression Integrated Moving Average (SARIMA) model is proposed for predicting hourly-measured wind speeds in the coastal/offshore area of Scotland. The SARIMA model's performance was further verified and compared with the newly developed deep-learning-based algorithms of Gated Recurrent Unit (GRU) and Long Short-Term Memory (LSTM). Regardless of the recent development of computational power has triggered more advanced machine learning algorithms, the proposed SARIMA model has shown its outperformance in the accuracy of forecasting future lags of offshore wind speeds along with time series. The comparative study among three predictive models showed that the SARIMA model offered the highest accuracy and robust healthiness.
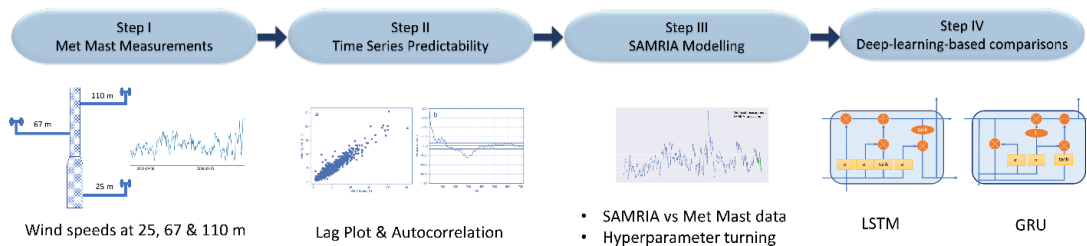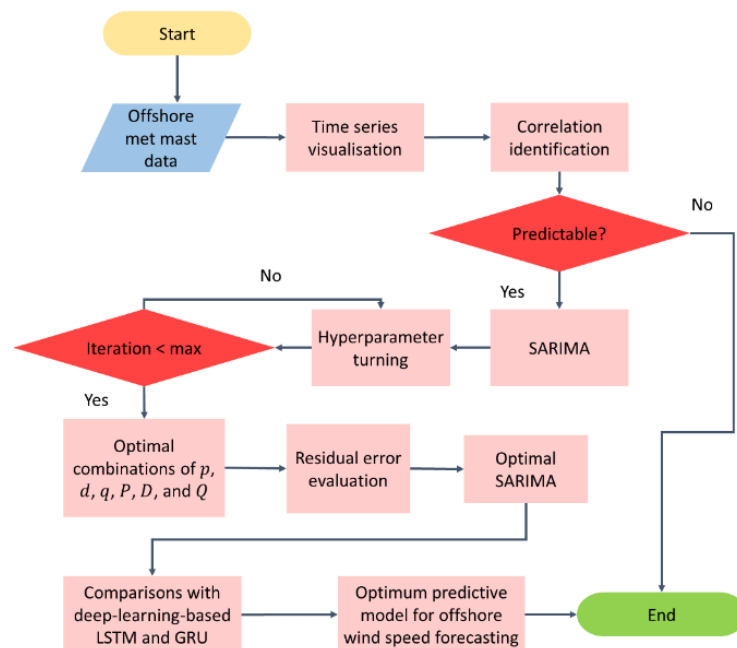
Figure 1: Diagram of applied methodology.

Figure 2: Offshore wind speed time series predictive algorithm processing flowchart.