ABSTRACT

This study models and projects wind speed and direction at 10-minute intervals in Banyuwangi (April 2020–March 2021) using the XLNet, followed by an analysis of intermittency probability. The preprocessing stage includes data cleaning, normalisation of wind speed, and transformation of wind direction into Cartesian components to address its cyclic nature. The data is arranged into fixed size time windows and predicted using a multi output regression head (speed, $\sin\theta$, $\cos\theta$). The validation splitting (train/validation/test), early stopping. Performance is evaluated using MAE, RMSE, and MAPE, the model demonstrates low and stable errors (MAE: 0.0342, RMSE: 0.0466, MAPE: 17.31%), accurately reconstructing both gradual trends and sharp fluctuations. Intermittency analysis is conducted based on the rate of change in wind speed and statistically derived thresholds for extreme events, which are then mapped to the turbine's power curve (cut-in 3 m/s, rated 11.6 m/s) to assess operational impacts. The results show that the most probable intermittency zone occurs around 6–7 m/s, while the extreme range effectively lies below the rated point, these conditions are relevant for mitigation strategies and system reliability planning. Overall, the XLNet approach proves effective in modelling highly variable and nonlinear wind dynamics, producing an intermittency risk map that is valuable for planning and controlling wind power plants in Banyuwangi.

Keywords: Intermittency, Wind Speed, Wind Direction, XLNet