ABSTRACT

Semarang City as the economic hub of Central Java, faces significant air pollution issues due to the increasing population, vehicles, and industrial activities. Exposure to air pollution raises the risk of respiratory disorders, worsens cardiovascular conditions, and accelerates bodily decline, leading to premature death. Regular air quality monitoring is crucial to identifying harmful air pollutants that may endanger health and the environment. This allows for understanding the extent of air pollution and implementing appropriate control measures to mitigate its negative impacts. This study aims to forecast air quality in Semarang City, focusing on the parameters PM10, PM2.5, O_3, SO_2, NO_2, and CO, and to calculate the Air Pollution Standard Index (ISPU). The forecasting is performed using the Long Short-Term Memory (LSTM) model, which is well-suited for time-series data due to its ability to retain long-term information and address gradient vanishing issues. The data used in this research is hourly air quality data collected over one year (November 1, 2023 – October 31, 2024). The study results indicate that the LSTM model can accurately predict air quality parameters. PM10 and PM2.5 achieved MAPE values of 22.52% and 22.56%, respectively, while O_3, SO_2, NO_2, and CO obtained MAPE values of 5.94%, 4.67%, 7.14%, and 6.01%, respectively. The 24-hour air quality forecast showed that the LSTM model was highly accurate, particularly for O_3, SO_2, NO_2, and CO. ISPU calculations based on the 24-hour forecast data on November 1, 2024, revealed that PM2.5 and SO_2 were identified as critical pollutant parameters with the hourly air quality in Semarang City predicted to fall within the moderate category.

Keywords: Semarang, Air Quality, Forecasting, Long Short-Term Memory