ABSTRACT

Stock price prediction is an important problem in the financial sector because it is influenced by nonlinear patterns in historical data. One widely used approach for modeling time series data is *Long Short-Term Memory* (LSTM). LSTM performance is highly dependent on appropriate hyperparameter selection. This study aims to optimize LSTM hyperparameters using the Grey Wolf Optimization (GWO) algorithm to predict the stock prices of PT Bank Negara Indonesia. The data used consist of daily historical stock price data of PT BNI covering the period from January 1, 2020 to August 31, 2025, with a total of 1,363 observations. The data are divided into training and testing sets with an 80%:20% ratio, using closing price as the input variable. The optimized hyperparameters include the number of hidden units, epochs, batch size, and learning rate. The results show that GWO significantly improves LSTM performance. The LSTM model without optimization achieved a MAPE of 3.91%, while the GWO-LSTM achieved a MAPE of 1.71%. The optimal hyperparameter configuration consists of 142 hidden units, 203 epochs, a batch size of 6, and a learning rate of 0.006460. These findings indicate that integrating LSTM with GWO effectively enhances stock price prediction accuracy and supports decision-making in capital markets.

Keywords: Stock Price Prediction, Long Short-Term Memory, Hyperparameter, Grey Wolf Optimization