

ABSTRACT

The volatility of stock price movements poses a significant challenge for accurate forecasting in capital market analysis. Conventional predictive methods often struggle to capture the nonlinear patterns inherent in financial time series data, thereby necessitating the use of more adaptive deep learning approaches. This study aims to develop a stock price prediction model for PT Telkom Indonesia Tbk (TLKM) using a Long Short-Term Memory (LSTM) network whose hyperparameters are optimized through the Particle Swarm Optimization (PSO) algorithm. PSO is employed to determine the optimal configuration of key hyperparameters, namely the number of units, learning rate, batch size, and dropout rate, while the LSTM architecture is used to learn temporal dependencies from historical daily closing prices. Model performance is evaluated using the Mean Absolute Percentage Error (MAPE). The results show that PSO successfully identified an optimal hyperparameter configuration consisting of 96 units, a learning rate of 0.0847, a batch size of 44, and a dropout rate of 0.3, producing a validation loss of 2446.2637. The resulting LSTM-PSO model achieving a MAPE of 1.7313%, which represents a substantial improvement over the baseline model's MAPE of 6.0612%. The optimized model is able to generate stable five-day-ahead forecasts for TLKM stock prices. These findings indicate that integrating LSTM with PSO metaheuristic optimization effectively enhances predictive accuracy and provides a strong methodological alternative for time series forecasting in capital market applications.

Keywords: Stock price prediction, PT Telkom Indonesia Tbk, LSTM-PSO.