

ABSTRACT

Stock forecasting is a critical task in financial markets, aimed at predicting future stock prices to aid investors in making informed decisions. This study explores the efficacy of a hybrid model combining Bidirectional Gated Recurrent Unit (BiGRU) and Bidirectional Long Short-Term Memory (BiLSTM) networks to enhance predictive accuracy. The proposed BiGRU-BiLSTM model leverages the strengths of both architectures, capturing short-term and long-term dependencies by processing data bidirectionally. We compare the performance of the proposed model with several benchmark models, including BiLSTM, GRU, Transformer, and BiGRU for single model and other hybrid model:BiLSTM-GRU, using Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and Mean Absolute Percentage Error (MAPE) as evaluation metrics.

The results indicate that the BiGRU-BiLSTM model consistently outperforms the benchmark models across various datasets, including Apple, Silver, Oil, and Gold, demonstrating superior predictive capability. The MAE, RMSE, and MAPE values for the proposed model show significant improvements, highlighting its robustness in capturing complex temporal patterns in stock prices. For the Apple dataset, with a MAE of 3.87, RMSE of 4.82, and MAPE of 2.43%, outperforming the best benchmark model. Similarly, in the Silver dataset, the proposed model achieved a MAE of 0.56, RMSE of 0.74, and MAPE of 2.52%, demonstrating its ability to accurately predict volatile market movements. The superior performance of the BiGRU-BiLSTM model in the Oil with MAE of 2.61, RMSE of 3.82 and MAPE of 4.62% also Gold datasets with MAE of 2.29, RMSE of 3.14 and MAPE of 2.16% further underscores its effectiveness and reliability. The success of this hybrid approach highlights the potential for combining advanced neural network architectures to capture intricate patterns in financial time series data, ultimately enhancing the precision and reliability of stock price predictions.

Keywords: Stock Forecasting, Deep Learning, BiGRU, BiLSTM.