

ABSTRACT

Bitcoin, one of the most popular digital assets, possesses a high level of volatility, which resulted in high level of both opportunities and risks for investors. This research aims to implement and optimize a Long Short-Term Memory model to predict Bitcoin price movements. This study utilizes a daily time series data of Bitcoin prices in USD for the period of February 2021 to February 2025. This research methodology comprised of a comparison of four different scenarios: a base model LSTM relying solely on price returns, a model with Bollinger Bands as an additional technical indicator features, a model with MACD as an additional technical features, and a model with combination both technical indicator as an additional feature (Hybrid). Each Scenario was tested with training using 50, 100, and 150 epochs to find the best configuration based on the resulting evaluation metrics. The evaluation metrics used were (Root Mean Squared Error), Mean Absolute Error (MAE), and Mean Absolute Percentage Error). This research resulted in the use of the Hybrid Model (LSTM + Bollinger Bands + MACD) trained for 150 epochs as the most superior model, with a prediction error percentage of 1.75% based on MAPE and RMSE of 2,121.21.

Keywords: *Bitcoin, Long Short-Term Memory, Bollinger Bands, Price Prediction.*