UNDERGRADUATE THESIS

BITCOIN PRICE MOVEMENT PREDICTION BASED ON ON-CHAIN DATA USING THE BILSTM METHOD

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Hereby declares that this undergraduate thesis contains no part of any other scientific work that has been submitted to obtain an academic degree at any higher education institution. Furthermore, it does not contain any work or opinions previously written or published by others, except for those which are explicitly cited in this thesis and listed completely in references.

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ABSTRACT

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Bitcoin is a decentralized cryptocurrency built on Blockchain technology that exhibits extremely high price volatility, making it difficult for investors to make sound investment decisions. This study aims to develop a Bitcoin price prediction model using the Bidirectional Long Short-Term Memory (BiLSTM) method based on on-chain data, including transaction volume, tx_count, active_spending_addresses, and fee_btc. The BiLSTM approach was chosen for its ability to process time series data bidirectionally, making it more effective at capturing extreme volatility patterns compared to conventional LSTM. The dataset was obtained from BigQuery and underwent preprocessing stages including data transformation, normalization, data splitting, and sequence formation. Experiments were conducted by varying the data split ratio, learning rate, and number of hidden layers. The optimal model was achieved using a 2-hidden-layer architecture, a learning rate of 0.0001, and a 90:10 data split, yielding MAE of 932.61, RMSE of 1,257.07, and MAPE of 0.97% classified as a highly accurate prediction. The model was subsequently deployed as a Flask-based web application in the form of an interactive single-page dashboard, enabling users to upload datasets, execute price forecasts, and visualize market analysis results in a unified interface.

Keyword: Bitcoin, BiLSTM, Data On-Chain, Forecasting, Deep Learning

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The author fully realizes that this thesis is still far from perfection and inherently contains limitations. Therefore, constructive criticism and structural suggestions from all parties are highly anticipated for future improvements. Ultimately, despite all limitations, the author sincerely hopes that this thesis will yield genuine benefits for the readers in general and for the author in particular.

Surabaya, June 08th 2026

Author

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