UNDERGRADUATE THESIS

BITCOIN PRICE PREDICTION USING SVR OPTIMIZED WITH BAYESIAN OPTIMIZATION

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APPROVAL SHEET

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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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Thesis title:	Bitcoin Price Prediction Using SVR Optimized with Bayesian Optimization
Supervisor:	1. Dr. Rizky Parlika, S.Kom, M.Kom. 2. Yisti Vita Via, S.ST, M.Kom.

With the world's largest market capitalization, Bitcoin exhibits strong heteroscedasticity and sharp price movements. The non-linear relationship between market variables and sharp price movements make conventional methods less effective in generating accurate predictions. Using hourly historical data (OHLCV) obtained from the Binance API from November 27, 2020, to November 26, 2025, this study employed a Support Vector Regression (SVR) approach with a Radial Basis Function (RBF) kernel automatically optimized through Bayesian Optimization. Testing was conducted using a chronological, multilevel data partitioning scheme, with 64% for training data, 16% for validation data, and 20% for test data. Meanwhile, model evaluation was conducted over three prediction horizons: 1 day (24 hours), 3 days (72 hours), and 7 days (168 hours) in the future to assess the model's accuracy and overall performance. Experimental results show that the SVR model optimized with Bayesian Optimization consistently outperforms the conventional Grid Search method across all time horizons. At the 1-day horizon, Bayesian Optimization successfully reduced the Mean Absolute Percentage Error (MAPE) by 34.46% to 1.94% and increased the coefficient of determination (R2) to 0.9480 compared to Grid Search. The most significant performance improvement in explaining data variability occurred at the 3-day horizon with an 11.97% jump in R2 to 0.8904.

Keywords: Bitcoin, Support Vector Regression, Bayesian Optimization, Cryptocurrency, Machine Learning, Prediction.

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The author realizes that in the preparation of the following thesis there are many shortcomings. For this reason, constructive criticism and suggestions from all parties are highly expected for the perfection of writing the following thesis. Finally, with all the limitations that the author has, hopefully the following report can be useful for all parties in general and the author in particular.

Surabaya, July 17th 2026

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