UNDERGRADUATE THESIS

A DECISION SUPPORT SYSTEM FOR BITCOIN PRICE PREDICTION BASED ON THE COMBINATION OF PATTERNED DATASETS, BTC DOMINANCE, AND THE FEAR & GREED INDEX

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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

Student Name / NPM	: Diva Ramadhani Ristiaji Putri/22081010227
Thesis Title	: A Decision Support System for Bitcoin Price Prediction Based on the Combination of Patterned Datasets, BTC Dominance, and the Fear & Greed Index
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High Bitcoin price volatility and the complexity of market factors make it difficult to interpret price movement directions using only a single indicator. Cryptocurrency market analysis is influenced by technical aspects, market structure, and investor sentiment, thus requiring a multi-indicator approach that is more structured and easier to interpret. However, most previous studies still focus on the separate use of indicators or on complex and less interpretable machine learning approaches. This study develops a web-based Decision Support System (DSS) that integrates patterned dataset, Bitcoin Dominance (BTC. D), and Fear & Greed Index (FGI). The dataset used consists of 1-hour Bitcoin OHLCV data from January 1st, 2022 to November 16th, 2025. The patterned dataset is constructed using Range (R), Top Range (TR), Lower Range (LR), as well as PTR and PLR ratios to identify Diamond Crash and Diamond Moon patterns. BTC. D is classified using a quantile-based approach into low, medium, and high categories, while FGI is grouped into five sentiment categories. The indicator combinations are analyzed using a rule-based approach and extracted into IF–THEN rules as the core of the system, supported by the ARIMAX model for short-term price estimation. The results show that the multi-aspect indicator combination is capable of generating highly reliable market direction signals. The rule-based system achieved an accuracy of 97.27%, an average ROI of 8.71%, a win rate of 97.27%, and a coverage of 100%. Further testing on new data from November 2025 to April 2026 also demonstrated consistent performance with an accuracy ranging from 95.65% to 97.55%. The developed system is capable of presenting market condition information, rule-based signals, indicator visualizations, and price estimations through a single web-based interface to help users understand cryptocurrency market conditions in a more structured manner.

Keywords: Decision Support System, Bitcoin, Patterned Dataset, Bitcoin Dominance, Fear & Greed Index, indicator combination.

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The author realizes that this thesis still has many shortcomings and limitations. Therefore, constructive criticism and suggestions are highly expected for the improvement of this research in the future.

Finally, the author hopes that this thesis can provide benefits for readers, contribute to scientific development, and support further research, especially in the field of cryptocurrency market analysis and Decision Support Systems.

Surabaya, May 22, 2026

Author

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GLOSSARY

ARIMA	:	Autoregressive Integrated Moving Average, which is a time series model for analyzing and forecasting historical data.
ARIMAX	:	Development of the ARIMA model that uses external variables (exogenous variables) as forecasting support.
Bearish	:	Market conditions that show the potential for a decline in asset prices.
Bitcoin	:	The first blockchain-based cryptocurrency used as a digital asset and electronic medium of exchange.
Bitcoin Dominance (BTC. D)	:	The percentage of Bitcoin's market capitalization dominance to the total cryptocurrency market.
Bullish	:	Market conditions that show the potential for an increase in asset prices.
Candlestick Chart	:	A form of price chart visualization that displays open, high, low, and close prices in a specific period.
Cryptocurrency	:	Digital currencies based on cryptographic and blockchain technology..
Dashboard	:	The main interface of the system is used to display information, visualizations, and analysis results in an integrated manner.
Data-Driven	:	An analytical approach that is based on data processing and interpretation.
Diamond Crash	:	Technical patterns that show high selling pressure based on patterned datasets.
Diamond Moon	:	Technical patterns that indicate high buying pressure based on patterned datasets.
Extreme Fear	:	Market sentiment indicating extremely high investor fear.

Extreme Greed	:	Market sentiment conditions that show the level of investor optimism are substantially high.
Fear	:	Market sentiment conditions that indicate negative investor tendencies.
Fear & Greed Index (FGI)	:	A cryptocurrency market sentiment indicator that describes the psychological state of investors.
Forecasting	:	The process of estimating or predicting future value based on historical data.
Glossary	:	A system feature that provides definitions of technical terms and indicators used on the dashboard.
Greed	:	Market sentiment conditions that show the tendency of investor optimism.
Help Center	:	System assistance features that contain dashboard usage guidance and interpretation of analysis results.
Horizon Analysis	:	Performance analysis based on a specific time range.
Market Indicators	:	A variable or parameter used to represent the conditions of the cryptocurrency market.
Machine Learning	:	A data learning-based computational method used to build prediction or classification models.
Neutral	:	Market conditions that do not show the dominance of bullish or bearish directions significantly.
No Signal	:	A condition when the system does not find a combination of indicators that correspond to the rule database.
OHLCV	:	Open, High, Low, Close, Volume; Historical data on the price and trading volume of the asset.
Patterned Dataset	:	The technical dataset is formed using the Range, Top Range, Lower Range, PTR, and PLR variables to identify market patterns.
PLR	:	Percentage Lower Range, which is the ratio of the lower range to the total range in the patterned dataset.

Prediction	:	The results of estimating the value or direction of future movements based on a specific model.
PTR	:	Percentage Top Range, which is the ratio of the top range to the total range in the patterned dataset.
Range (R)	:	The difference between the highest and lowest prices in a price data period.
Return on Investment (ROI)	:	The percentage of profit or loss based on the results of the analysis or investment.
Rule-Based System	:	A decision-making system based on IF–THEN rules derived from combinations of indicators.
Rule Matching	:	The process of matching the condition of the indicator against the rule base available on the system.
Market Sentiment	:	The psychological condition or perception of investors towards the cryptocurrency market.
Rules Signal-Based	:	Market direction signals are generated from the rule matching process to a combination of market indicators.
Streamlit	:	A web-based Python framework used to build interactive dashboards.
Time Series	:	Data compiled in a specific time order.
Timestamp	:	The time marker on the time series data is used as an analysis reference.
Top Range (TR)	:	The difference between the highest price and the maximum value of the open or close price on the candle.
Lower Range (LR)	:	The difference between the minimum value of the open or close price and the lowest price on the candle.
Usability	:	The level of ease of use of a system by users.
Visualization	:	Presentation of data or analysis results in visual form such as graphs or charts.
Volatility	:	The rate of change or fluctuation in the price of an asset in a given period.

Web-Based System	:	A system that runs through a web browser without the need for additional application installation.
Window Analysis	:	The range of historical data visualizations used on the analysis dashboard.
Win rate	:	The percentage of signal success is based on the results of historical evaluation.