



## **UNDERGRADUATE THESIS**

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

**DIVA RAMADHANI RISTIAJI PUTRI**  
NPM 22081010227

### **THESIS ADVISORS**

Dr. Rizky Parlika, S.Kom., M.Kom.  
Hendra Maulana, S.Kom., M.Kom.

**MINISTRY OF HIGHER EDUCATION, SCIENCE, AND TECHNOLOGY  
UNIVERSITAS PEMBANGUNAN NASIONAL VETERAN JAWA TIMUR  
FACULTY OF COMPUTER SCIENCE  
INFORMATICS STUDY PROGRAM  
SURABAYA  
2026**

## APPROVAL SHEET

### DECISION SUPPORT SYSTEM FOR BITCOIN PRICE DIRECTION USING A COMBINATION OF PATTERNED DATASET, BTC DOMINANCE, AND FEAR & GREED INDEX

By:  
DIVA RAMADHANI RISTIAJI PUTRI  
NPM. 22081010227

Has been defended before, and accepted by, the Board of Assessors of the Thesis Examination of the Informatics Study Program, Faculty of Computer Science, Universitas Pembangunan Nasional Veteran Jawa Timur, on May 25, 2026:

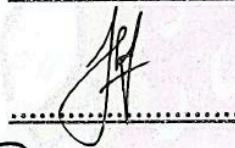
Approved,

Dr. Rizky Parluka, S.Kom., M.Kom.  
NIP. 19840518 202121 1 003



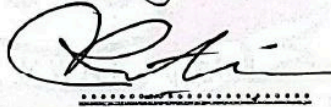
(Advisor I)

Hendra Maulana, S.Kom., M.Kom.  
NIP. 19831223 202521 1 040



(Advisor II)

Retno Mumpuni, S.Kom., M.Sc.  
NIP. 19870716 202521 2 045



(Head Assessor)

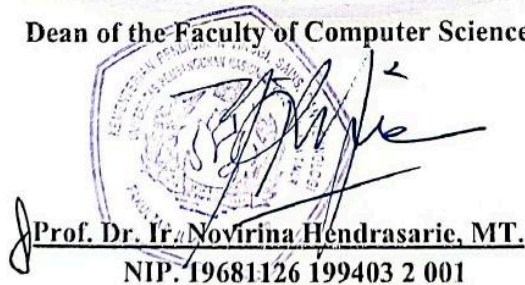
Henni Endah Wahanani, S.T., M.Kom.  
NIP. 19780922 202121 2 005



(Assessor I)

Acknowledge by,

Dean of the Faculty of Computer Science



Prof. Dr. Ir. Novirina Hendrasarie, MT.  
NIP. 19681126 199403 2 001

## **APPROVAL SHEET**

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By:  
DIVA RAMADHANI RISTIAJI PUTRI  
NPM. 22081010227

Approved to proceed to the Thesis Examination

Approved by,

Coordinator of Informatics Study Program  
Faculty of Computer Science



Dr. Intan Yuniar Purbasari, S.Kom., M.Sc.

NIP. 19800602 202521 2 029

## STATEMENT OF ORIGINALITY

I am the undersigned:

Student Name : Diva Ramadhani Ristiaji Putri  
NPM : 22081010227  
Degree Program : Bachelor's (S1)  
Study Program : Informatics  
Faculty : Faculty of Computer Science

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Surabaya, May 25, 2026  
Declarant,



DIVA RAMADHANI RISTIAJI PUTRI  
NPM. 22081010227

## 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

Supervisor

1. Dr. Rizky Parlika, S.Kom., M.Kom.
2. Hendra Maulana, S.Kom., M.Kom.

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.

## ACKNOWLEDGEMENTS

All praise and gratitude be to Allah SWT for His blessings, guidance, and mercy, which have enabled the author to complete this thesis entitled “A Decision Support System for Bitcoin Price Prediction Based on the Combination of Patterned Datasets, BTC Dominance, and the Fear & Greed Index” properly and on time.

The preparation of this thesis was carried out as one of the requirements to obtain a Bachelor's degree in Computer Science at the Informatics Study Program, Faculty of Computer Science, Universitas Pembangunan Nasional “Veteran” Jawa Timur. During the process of completing this thesis, the author received a great deal of assistance, support, guidance, motivation, and prayers from many parties. Therefore, on this occasion, the author would like to express sincere gratitude to:

1. Allah SWT for all the blessings, health, strength, and ease given to the author throughout the thesis preparation process.
2. Prof. Dr. Ir. Novirina Hendrasarie, M.T., as the Dean of the Faculty of Computer Science, Universitas Pembangunan Nasional “Veteran” Jawa Timur.
3. Dr. Intan Yuniar Purbasari, S.Kom., M.Sc., as the Coordinator of the Informatics Study Program, Faculty of Computer Science, Universitas Pembangunan Nasional “Veteran” Jawa Timur.
4. Dr. Rizky Parlika, S.Kom., M.Kom., as Supervisor I, who has provided guidance, direction, motivation, and valuable input during the thesis preparation process.
5. Mr. Hendra Maulana, S.Kom., M.Kom., as Supervisor II, who has provided valuable advice, guidance, and support during the completion of this thesis.
6. Mrs. Retno Mumpuni, S.Kom., M.Sc. as Head of Assessor, who has provided constructive criticism, suggestions, and valuable input for the improvement of this research.
7. Mrs. Henni Endah Wahanani, S.T., M.Kom. as an Assessor I, who has provided evaluation, direction, and valuable suggestions during the thesis improvement process.

8. The author's beloved parents, Mrs. Eny Setyawati and Mr. Nanang Sat Ristiaji, who have always given endless prayers, love, support, motivation, and sacrifices to the author.
9. The author's beloved sisters, Anggraena Ristiaji Putri, S.S., and Megawati Ristiaji Putri, S.P., along with her husband, as well as the author's beloved nieces, Rania Bintang Risetiaji and Askara Hafidz Risaminanto, who always bring happiness and encouragement to the author.
10. The author's best friends, "Bidadari Syurga," namely Cynthia Dwi Rahmadewi, Choirun Nisa', Hanin Fatma Soraya, Nabila Anggita Luna, Aprinia Salsabila Roiqoh, Dela Ayu Putri Mayona, and Revelin Putri Syamjovanka, who have accompanied the author throughout the academic journey and provided support, assistance, and countless memories during the study period.
11. International Office staff and colleagues, namely Mbak Ita, Mbak Renata, Mbak Xera, Mas Hasan, as well as colleagues such as Faliha Nayza Syafhan Siregar, Najma Choirun Nisa, Andi, Faldo, Sreng, Vania, and others who cannot be mentioned one by one, who have provided valuable experiences, support, and encouragement to the author.
12. The author's best friends, Elaura Chikayoshi Adrian and Laura Amelia Syafira, who have always provided support, encouragement, and companionship throughout the thesis preparation process.
13. Friends since junior high school, namely Sayyidah Soba Irena and Ellis Kusuma Wardani, who have always been supportive and become a place for the author to share stories and experiences.
14. Informatics friends, especially Silvia Dwi Cahyani, Nur Septia Fajrina, Mulyani Setya Bakti, Gamar Ramadhani Malik, Heaven Ade Aldrico, and other friends who have accompanied the author throughout academic activities, course registration, group assignments, and various other academic processes.
15. AIESEC friends, organizational colleagues, and all other parties who cannot be mentioned one by one, who have provided experiences, support, and encouragement during the academic journey.

16. Lastly, the author would like to thank herself for staying strong, persistent, and committed throughout this challenging journey, for never giving up despite all the obstacles, and for believing that every process will eventually lead to meaningful growth and achievement.

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.