



**UNDERGRADUATE THESIS**

# **A Cryptocurrency Trading Decision Support System Based on Multi-Indicator Technical Analysis**

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UNIVERSITAS PEMBANGUNAN NASIONAL VETERAN JAWA TIMUR  
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INFORMATICS STUDY PROGRAM  
SURABAYA  
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APPROVAL SHEET

A CRYPTOCURRENCY TRADING DECISION SUPPORT SYSTEM  
BASED ON MULTI-INDICATOR TECHNICAL ANALYSIS

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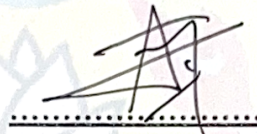
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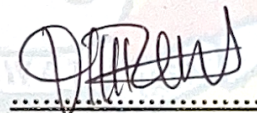
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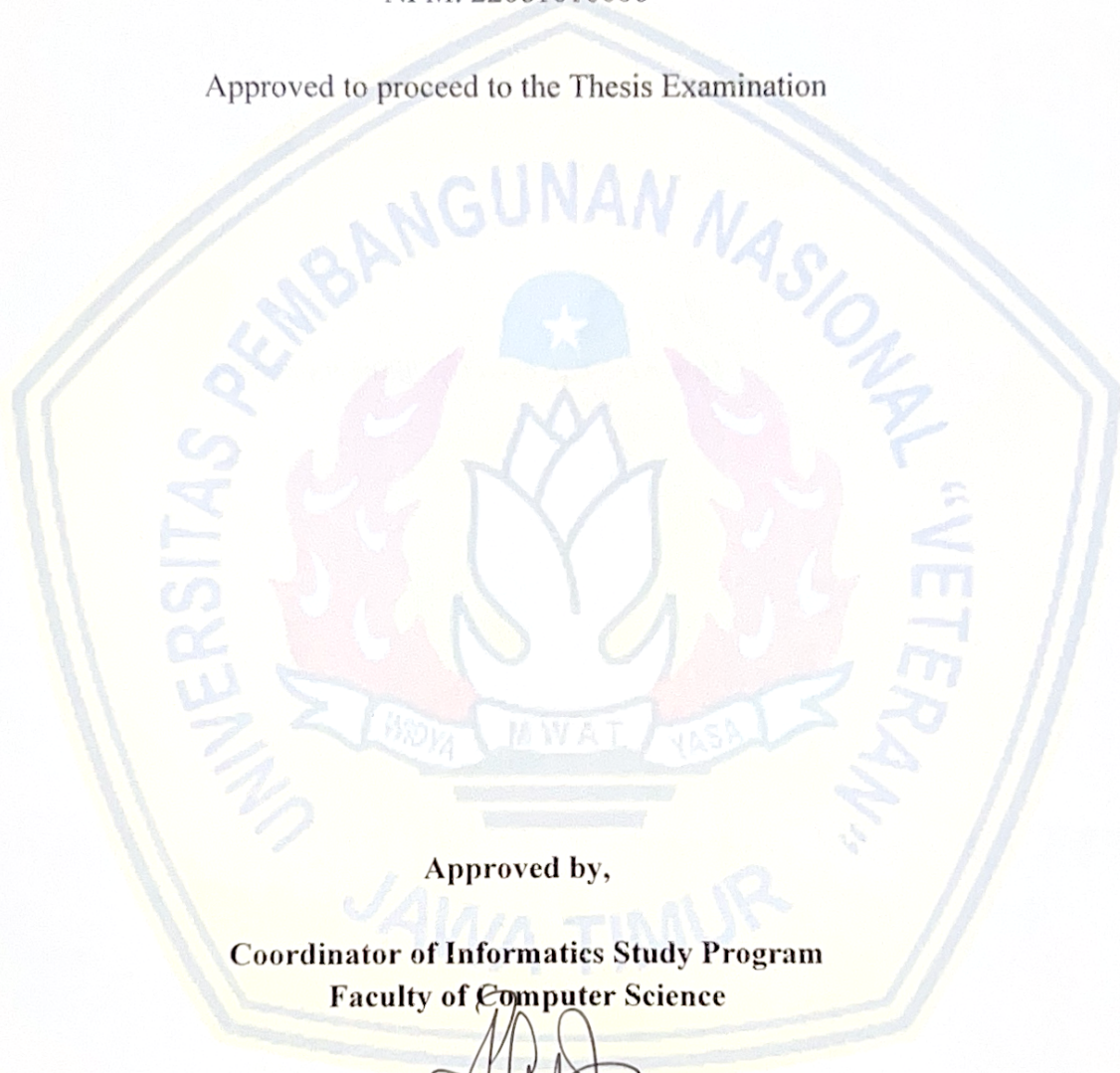
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## ABSTRACT

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The highly volatile nature of cryptocurrency prices makes investment decisions based on intuition risky. Furthermore, relying on a single technical indicator is prone to generating false signals, while trading platforms typically display indicators separately, leaving analysis dependent on user subjectivity. These conditions make it difficult for users to make objective and consistent decisions. To address these issues, this study develops a cryptocurrency decision support system website based on multi-technical-indicator analysis. The system combines eight technical indicators SMA, EMA, RSI, MACD, Bollinger Bands, Stochastic Oscillator, Stochastic RSI, and Parabolic SAR using a weighted approach to generate BUY, SELL, or NEUTRAL signals. The system also features a Telegram bot to send real-time signal notifications to users. The evaluation was conducted using a backtesting method with metrics including ROI, Win Rate, Maximum Drawdown, and Sharpe Ratio. Test results for the ADA-USD asset over the period January 1 – May 31, 2025, show that the multi-indicator method generated an ROI of 188.51%, outperforming the best single indicator's 86.37% while keeping risk under control. Additionally, the proposed method demonstrated better performance on 5 out of the 7 cryptocurrencies with the largest market capitalizations. Overall, the technical multi-indicator approach is capable of improving signal quality and helping to balance profitability and risk in cryptocurrency decision-making.

**Keywords:** *Cryptocurrency, Decision Support System, Technical Analysis, Multi-Indicator, Backtesting.*

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Surabaya, May 22th 2026

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Author

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## LIST OF NOTATIONS

SMA	:	Simple Moving Average
EMA	:	Exponential Moving Average
RSI	:	Relative Strength Index
StochRSI	:	Stochastic Relative Strength Index
PSAR	:	Parabolic Stop and Reverse
$n$	:	Total of observation periods
$Close_i$	:	Closing price in the $i$ -th period
$\alpha$	:	Smoothing factor for the EMA
MACD	:	Moving Average Convergence Divergence
<i>Signal line</i>	:	Exponential Moving Average of the MACD line
Histogram	:	Difference between the MACD line and the signal line
$StdDev_n$	:	Standard deviation of prices over $n$ periods
$k$	:	Standard deviation multiplier constant for Bollinger Bands
$\Delta_i$	:	Price change difference ( $Close_i - Close_{i-1}$ )
$Gain_i$	:	Price increase value in the $i$ -th period
$Loss_i$	:	Price decrease value in the $i$ -th period
RS	:	Relative Strength (average $Gain / Loss$ )
%K	:	Main value of the Stochastic Oscillator
%D	:	Stochastic Oscillator signal line
C	:	Last closing price
$L_{14}$	:	Lowest price over the last 14 periods
$H_{14}$	:	Highest price over the last 14 periods
AF	:	Acceleration Factor in PSAR
EP	:	Extreme Point in PSAR
$W_i$	:	Set of candidate weights for indicator $i$ , $W_i = \{0,1,2,3,4\}$
$\omega_i$	:	Weight of indicator $i$ selected from $W_i$

<i>Signal<sub>i</sub></i>	:	Base signal of indicator <i>i</i>
<i>Score</i>	:	Aggregate score before normalization
<i>FinalScore</i>	:	Final normalized score
ROI	:	Return on Investment
<i>Win Rate</i>	:	Percentage of profitable trades
MDD	:	Maximum Drawdown
<i>Sharpe Ratio</i>	:	The Sharpe ratio as a measure of the relationship between return and risk