UNDERGRADUATE THESIS

OPTIMIZING HYBRID LSTM-GRU HYPERPARAMETERS USING GENETIC ALGORITHM FOR PREDICTING BANKING STOCK PRICES LISTED IN THE LQ45 INDEX

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SURABAYA
2026

APPROVAL SHEET

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ABSTRACT

Student Name / NPM	:	Mordekhai Gerine Lumangkun / 20081010041
Thesis Title	:	OPTIMIZING HYBRID LSTM-GRU HYPERPARAMETERS USING GENETIC ALGORITHM FOR PREDICTING BANKING STOCK PRICES LISTED IN THE LQ45 INDEX
Supervisor	:	1. Made Hanindia Prami Swari, S.Kom., M.Cs. 2. Andreas Nugroho Sihananto, S.Kom., M.Kom.

This study is motivated by the high volatility of banking sector stock prices in the LQ45 index, which calls for accurate and adaptive forecasting methods. Advances in deep learning, particularly Recurrent Neural Network (RNN) models such as Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU), provide the capability to capture patterns in time-series data. However, model performance is highly influenced by the selection of optimal hyperparameters. Therefore, this study examines the application of a hybrid LSTM-GRU model optimized using a Genetic Algorithm (GA). The data used includes daily stock prices and internal company factors such as ROA and ROE for the period from November 2020 to June 2025. The research stages include collecting daily stock price data and financial ratio reports from 6 banking issuers listed in the LQ45 Index, data preprocessing, model training, and hyperparameter optimization using GA. Model evaluation was conducted using RMSE, MAE, and MAPE. The results show that the LSTM-GRU hybrid model optimized with GA significantly improves prediction accuracy compared to the unoptimized model, as evidenced by a cumulative reduction in the average error values across all evaluation metrics: 18.42% for RMSE, 20.61% for MAE, and 19.80% for MAPE. Thus, the combination of the hybrid method and evolutionary-based optimization has proven effective in improving stock price prediction performance.

Keywords: Hybrid LSTM-GRU, Genetic Algorithm, Hyperparameter Optimization, Stock Prediction, Time Series

ACKNOWLEDGEMENTS

First and foremost, the author offers the highest praise and deepest gratitude to Lord Jesus Christ. It is by His unwavering grace, infinite wisdom, and divine guidance that this academic journey has reached its fruition. Through every challenge, in every moment of difficulty, breakthrough, and success, His presence provided the strength, perseverance, and hope necessary throughout the process to complete this work. This thesis, titled **"Optimizing Hybrid LSTM-GRU Hyperparameters Using Genetic Algorithm for Predicting Banking Stock Prices Listed in the LQ45 Index"**, is submitted in partial fulfillment of the requirements for a Bachelor's Degree in the Informatics Study Program, Faculty of Computer Science, at Universitas Pembangunan Nasional Veteran Jawa Timur. The author recognizes that this achievement is not a solitary one but the culmination of support, guidance, and prayers from many parties who have contributed to this scholarly endeavor. Therefore, through this preface, the author wishes to extend his deepest and most heartfelt gratitude to:

1. The Lord Jesus Christ, the ultimate source of all knowledge, strength, and hope amidst the seasons of uncertainty encountered throughout this journey. The author is profoundly grateful for His faithfulness in making all things beautiful in His perfect timing. This work stands as a testament to the promise of Isaiah 43:2, *"When you pass through the waters, I will be with you; and through the rivers, they shall not overwhelm you; when you walk through fire, you shall not be burned, and the flame shall not consume you."* Through His divine promise, the author learned that one should not merely wait for the storm to pass, but rather learn to dance in the midst of the rain, and His presence has guided the author on this academic journey to its successful completion.
2. The author's beloved parents, Mr. Novie Gerard Lumangkun and Mrs. Ivonne Ineke Massie, for their unceasing prayers that they have faithfully lifted to the heavens and for their unwavering support on the pursuit of their children's future and happiness. The author is profoundly grateful for their boundless love, sacrifice, and spiritual guidance which have been the

foundation of this journey. This modest work and the degree earned are wholeheartedly dedicated to Papa and Mama.

3. Mrs. Prof. Dr. Ir. Novirina Hendrasarie, M.T. as the Dean of the Faculty of Computer Science, National Development University "Veteran" East Java.
4. Mrs. Fetty Tri Anggraeny, S.Kom., M.Kom. as the Coordinator of Informatics Study Program, Faculty of Computer Science, National Development University of East Java.
5. Mrs. Made Hanindia Prami Swari, S.Kom., M.Cs. as the primary advisor and Mr. Andreas Nugroho Sihananto, S.Kom., M.Kom. as the co-advisor, for their expert guidance, invaluable mentorship, and constant encouragement throughout every stage of this research. The author is profoundly grateful for their patience, wisdom, and the time they dedicated to the refinement of this thesis.
6. Mr. Dr. Faisal Muttaqin, S.Kom., M.T. and Mr. Muhammad Muharrom Al Haromainy, S.Kom., M.Kom. as the thesis examiners, for their constructive criticism, insightful feedback, and invaluable guidance during the examination process, which significantly improved the quality of this research.
7. The author's beloved sister, Zefanya Sabathini Lumangkun, for her support, faithful prayers, and for serving as a spirited source of motivation, specifically to ensure the author reached this milestone ahead of her.
8. Richard Petrus Haposan Siagian, S.Kom. and Daniel Manalu, S.Kom., as fellow expat in this academic journey, shared years of living away from home. The author is deeply grateful for his unwavering friendship throughout university life, specifically for his role in providing constant reassurance and the necessary encouragement during moments of doubt and despair.
9. The one whose name remains unspoken but whose presence is forever etched in the author's journey. The author offers hos deepest gratitude for being a steadfast companion in this life as a stranger in this foreign city, Surabaya, a place the author had never known and where no kin resided, she became a sanctuary of care. Her kindness was found in the medicine box

she provided when illness struck and in the meals she prepared to sustain the author when resources were lean. She was the quiet strength that urged the author to see this academic pursuit to its end, a debt of gratitude the author realized perhaps too late, but carries with profound respect. The author is eternally thankful for the love once felt and for every prayer, every word of encouragement, and every moment of motivation she offered so selflessly. To this individual, wherever life may lead her, may your path always be paved with the same boundless kindness you bestowed upon the author. May Lord Jesus Christ always bless and protect her, shielding her with His grace wherever her may be. Wherever this life takes, may the compass always find its way back.

Finally, the author humbly acknowledges that this research is far from perfection and that the pursuit of knowledge is a continuous journey. Despite its inherent limitations, it is the author's sincere hope that this study provides valuable insights into the optimization of hybrid deep learning architectures and serves as a meaningful contribution to the advancement of the field of Informatics, particularly within the academic community of Universitas Pembangunan Nasional Veteran Jawa Timur. The author remains open to constructive criticism and suggestions that may further refine this work. May this thesis serve as a stepping stone for future exploration and be of benefit to all who seek to push the boundaries of science and technology.

Surabaya, 13rd April 2026

Author

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