



UNDERGRADUATE THESIS

**FORECASTING THE UNEMPLOYMENT RATE
OF SIDOARJO REGENCY USING GATED
RECURRENT UNIT METHOD WITH BAYESIAN
HYPERPARAMETER OPTIMIZATION**

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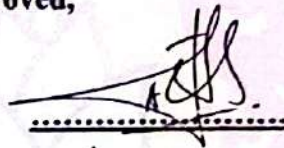
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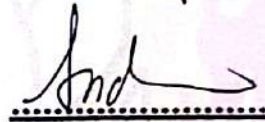
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STATEMENT OF ORIGINALITY

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ABSTRACT

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Unemployment is a crucial indicator that reflects the quality of regional development, including in Sidoarjo Regency, East Java. This study aims to develop a multivariate time series forecasting model to predict the Open Unemployment Rate (TPT) in Sidoarjo by integrating macroeconomic variables such as GDP Growth, Investment, Working-Age Population, and Human Development Index (HDI). This study uses annual data for the period 2005 to 2024 obtained from the Central Statistics Agency (BPS) of Sidoarjo Regency. The methodology used is the Gated Recurrent Unit (GRU) model, a type of Recurrent Neural Network (RNN) designed to capture non-linear patterns and long-term dependence on sequential data. To improve model performance, Bayesian Hyperparameter Optimization is applied to find the optimal configuration of key parameters such as the number of GRU units, window size, learning rate, dropout rate, number of epochs, and batch size. Data goes through the pre-processing stage in the form of Min-Max normalization and sequence formation using the sliding window technique. Model performance is evaluated using Root Mean Square Error (RMSE). The test results of 729 hyperparameter combinations showed that the best configuration was found with a combination of 16 GRU units, window size 2, learning rate 0.02, dropout rate 0.5, 100 epoch, and batch size 4. The multivariate GRU model in the best configuration produces an RMSE value of 0.067978 with a forecasting accuracy of 94.68%. These results indicate that the integration of GRU with Bayesian optimization provides an accurate method for forecasting the unemployment rate, as well as offering insights for data-driven policy formulation in Sidoarjo Regency.

Keywords : Unemployment Rate Forecasting, *Gated Recurrent Unit (GRU)*, Bayesian Hyperparameter Optimization, Multivariate Time Series, Sidoarjo

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Keywords: *Unemployment Rate Forecasting, Gated Recurrent Unit (GRU), Bayesian Hyperparameter Optimization, Multivariate Time series, Sidoarjo*

FOREWORD

Praise be to Allah SWT for all His graces, guidance, and gifts to the author so that the thesis with the title "Forecasting the Unemployment Rate in Sidoarjo Regency Using the Method *Gated Recurrent Unit (GRU)* with Bayesian Hyperparameter Optimization" can be solved well and on time. The author expresses his deepest gratitude to all parties who have helped both directly and indirectly during the process of preparing this thesis. In particular, the author would like to thank the:

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The author realizes that in the preparation of this thesis there are still shortcomings. Therefore, constructive criticism and suggestions from various parties are highly expected for the perfection of this work. Finally, with all the limitations that exist, the author hopes that this thesis report can provide benefits for all parties, especially in the development of science in the field of artificial intelligence.

Surabaya, May 21, 2026

Author

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