

CHAPTER V

CONCLUSION AND SUGGESTIONS

5.1. Conclusion

1. A multivariate GRU model with hyperparameter Bayesian optimization was applied to predict the Open Unemployment Rate (TPT) of Sidoarjo Regency. The best configurations obtained (units=16, window_size=2, learning_rate=0.02, dropout_rate=0.5, epochs=100, batch_size=4) resulted in an RMSE value of 0.067978 and an accuracy of 94.68%, indicating that the average prediction error was very small and that the model was able to follow the actual data trends with a high degree of accuracy.
2. Bayesian Optimization improves the performance of GRU models by building a probabilistic model (surrogate model) of objective functions (RMSEs), and then iteratively selecting the most promising hyperparameter combinations based on the acquisition function. This approach allows the search of a wide range of hyperparameter spaces to be carried out efficiently and in a directional manner. As a result, configurations such as dropout_rate=0.5 that prevents overfitting on limited data, and learning_rate=0.02 that maintains convergence stability, can be found automatically something that is difficult to achieve through manual selection. Comparison between test scenarios shows that the configuration of Bayesian optimization results has a real impact on the stability and accuracy of TPT forecasting in Sidoarjo Regency.

5.2. Suggestions

1. Expansion of predictor variables by including macroeconomic and other policy indicators such as inflation, minimum wage, or the realization of labor-intensive projects to enrich the model's input information.
2. Increase the number of data observations using higher-frequency data (quarterly/monthly) if possible, or extend the observation period, so that the model can better capture temporal patterns and reduce prediction uncertainty.
3. Explore more complex model architectures, such as GRU-LSTM hybrid models, Bidirectional GRU, or Transformer-based approaches, to see if such architectural combinations can result in RMSE values lower than 0.1258 on

test data. The expansion of the hyperparameter search space in the Bayesian Optimization process, including variations in the number of GRU layers and activation functions, is also worth exploring.

4. The generalization test of the model by applying the same approach to other regions in East Java or areas with similar economic characteristics, to test the consistency and effectiveness of the Bayesian-optimized multivariate GRU model in the context of TPT forecasting in various regions with different employment dynamics.