CHAPTER V
CONCLUSION

This chapter presents the conclusions of the research based on the results of model evaluation, hyperparameter optimization, and system implementation for the classification of RTLH assistance recipient priorities using LightGBM with Bayesian Optimization. In addition, this chapter also provides suggestions and recommendations for future research in order to improve the performance and development of the classification system more effectively and optimally.

5.1 Conclusions

Based on the overall research process that has been conducted, several conclusions can be drawn regarding the implementation of the LightGBM algorithm with Bayesian Optimization for the classification of RTLH assistance recipient priorities in Jombang Regency. The conclusions obtained from this study are as follows:

1. The implementation of the LightGBM algorithm proved to be effective for classifying RTLH assistance recipient priorities on data with diverse variables and complex relationships among features. The LightGBM model successfully processed a dataset consisting of 9,173 records with more than 30 socio-economic and housing condition variables. The ability of LightGBM to handle non-linear relationships among features, combined with its computational efficiency through histogram-based learning and leaf-wise growth techniques, makes it suitable for large-scale datasets such as social assistance program data.
2. Bayesian Optimization was successfully applied to determine the optimal hyperparameter combination for LightGBM, resulting in improved classification performance. The optimization process identified the best hyperparameter configuration, including learning_rate = 0.22, num_leaves = 74, and max_depth = 4, which increased the model F1-Score from 0.94 to 0.96, representing an improvement of approximately two percentage points. This method proved to be more efficient than traditional approaches such as

grid search or random search in exploring complex hyperparameter search spaces.

3. Based on the testing results, the implementation of Bayesian Optimization on LightGBM was able to produce a hyperparameter configuration that achieved better performance compared to the baseline model on the dataset used in this study. This improvement was reflected in the increased values of accuracy, recall, precision, and F1-Score on the testing data. However, these results are specific to the characteristics of the RTLH dataset from Jombang Regency used in this research. Therefore, implementation on datasets or regions with different characteristics would still require further evaluation and testing. The resulting model is intended to function as a decision support system and does not replace field verification processes or final decisions made by the relevant authorities.

5.2 Suggestions

Based on the research results and the implementation process that has been carried out, several suggestions can be proposed for future development and research improvement. The suggestions from this study are as follows:

1. The optimized model can be integrated into a practical decision support system, such as a web-based or desktop-based application, to assist related government agencies in the pre-selection process of prospective RTLH assistance recipients. This implementation is expected to improve efficiency and increase objectivity in the assistance selection process.
2. Further testing using real-time data and datasets from other regions is recommended to evaluate the validity and generalization capability of the model. A pilot project implementation in several districts could be conducted to compare the model prediction results with actual field verification decisions. In addition, applying the model to datasets from other regencies may help evaluate the model's ability to adapt to different data characteristics.