

## **CHAPTER V**

### **CONCLUSION**

This chapter is the final part of the study, containing conclusions and recommendations based on the results obtained. The conclusions are drawn based on the results of data processing, the modeling process, performance evaluation, and the implementation of a hypertension risk prediction model using the CatBoost algorithm optimized with Optuna. Additionally, recommendations are provided as considerations for future research.

#### **5.1 Conclusions**

These results demonstrate that the CatBoost model is capable of predicting hypertension risk based on lifestyle patterns, this study successfully addressed the research questions through modeling, hyperparameter optimization, and model performance evaluation. Therefore, the following conclusions are drawn.

1. The CatBoost model is capable of predicting the risk of hypertension based on lifestyle patterns. Based on the test results across three data splitting scenarios, the baseline model achieved accuracy values ranging from 68.84% to 98.32%, precision ranging from 88.68% to 99.01%, recall ranging from 45.63% to 98.06%, and an F1-score ranging from 60.26% to 98.38%. Based on these test results, the CatBoost model can be used to predict the risk of hypertension based on lifestyle patterns.
2. Hyperparameter optimization using Optuna was shown to improve the CatBoost model's performance in predicting the risk of hypertension. Based on test results across three data splitting scenarios, the baseline model's performance with accuracy ranging from 68.84% to 98.32%, precision from 88.68% to 99.01%, recall from 45.63% to 98.06%, and an F1-score ranging from 60.26% to 98.38%. After optimization, these metrics improved to accuracy ranging from 99.16% to 99.83%, precision from 98.72% to 100%, recall from 99.03% to 99.68%, and an F1-score ranging from 99.20% to 99.84%. These results demonstrate that hyperparameter optimization using Optuna can improve the performance of the CatBoost model across all evaluation metrics.

## **5.2 Recommendations**

Based on the results of this study, there are several suggestions that can be considered for future research. Further development can focus on data, the hyperparameter optimization process, or system implementation to achieve better performance. The suggestions are as follows:

1. Future research could use a dataset with a larger volume of data and more diverse characteristics so that the model can produce more representative predictions.
2. The hyperparameter optimization process can be improved by increasing the number of trials or applying other optimization methods to obtain a more optimal parameter configuration.
3. System development can be carried out by adding data storage features, prediction history, and database integration so that the application can be used more effectively and sustainably.