

## **CHAPTER V**

### **CONCLUSION**

#### **5.1 Conclusions**

Based on the results of a study on predicting the number of blood donors using the Extreme Gradient Boosting algorithm based on historical and demographic data at the PMI Blood Donation Unit in Bojonegoro Regency, the following conclusions can be drawn.

1. The XGBoost model is capable of predicting the number of blood donors on a daily basis with good performance across various demographic categories. The  $R^2$  value in the daily test data shows a fairly high result across all testing scenarios. In the blood type scenario, the  $R^2$  value ranged from 0.859 to 0.927 in the gender scenario, it was 0.839 for men and 0.755 for women; while in the age group scenario, it reached a peak of 0.974 for the 17-24 age group. These results indicate that the model is capable of explaining most of the variation in the daily donor count data.
2. The XGBoost model is also capable of predicting the number of blood donors at the monthly aggregation level with excellent performance. The  $R^2$  value for monthly predictions ranged from 0.952 to 0.997 across all testing scenarios. The highest value was obtained in the 17-24 age group scenario with an  $R^2$  value of 0.997. These results indicate that the model has excellent capability in capturing trends in the number of donors over a longer period.
3. A comparison of daily and monthly predictions shows that monthly predictions have a higher accuracy rate than daily predictions. This is because the monthly data aggregation process reduces daily fluctuations, allowing the model to capture historical blood donation patterns more consistently. Based on all testing scenarios, the age group based model demonstrated the most stable and accurate performance compared to the blood type and gender based models

## 5.2 Recommendations

Based on the results of this study, several recommendations can be made for future research and implementation in operational settings.

1. Future research could incorporate additional external variables that may influence the number of blood donors, such as weather conditions, national holidays, or blood donation campaigns, so that the model can account for external factors affecting donor participation.
2. Future research could compare the XGBoost algorithm with other machine learning algorithms such as Random Forest, LightGBM, or time-series-based deep learning methods like LSTM to provide a more comprehensive comparison of model performance.
3. The predictive model developed in this study can be expanded into a decision support system integrated with the PMI information system to assist in planning blood donation activities and managing blood supplies more effectively.