ABSTRACT

The digital transformation of the banking industry has necessitated the development of credit scoring systems that are not only accurate but also adaptive to complex and heterogeneous data. This study aims to develop and evaluate a credit scoring model based on *ensemble supervised learning* to predict credit risk in a consumer loan service (Product X) at Bank XYZ. Several ensemble algorithms, including Random Forest, AdaBoost, LightGBM, CatBoost, and XGBoost, were compared with a single classification method, Decision Tree. Model performance was evaluated using metrics such as precision, recall, F1-score, and ROC-AUC. The results show that XGBoost outperformed other models, achieving the highest ROC-AUC score of 0.803, with strong generalization ability and low risk of overfitting. SHAP analysis identified key features influencing the model, including loan tenor, loan amount (plafond), income, and Days Past Due (DPD) history. Compared to the baseline Decision Tree model (ROC-AUC 0.573), the XGBoost model significantly improved classification accuracy for good and bad customers. It also demonstrated the potential to reduce the Non-Performing Loan (NPL) rate from 4% to below 3% and increase the approval rate from 65% to over 70%, in line with the Key Performance Indicators (KPI) of Product X. These findings confirm that applying *ensemble supervised learning* models—particularly XGBoost—can deliver strategic contributions in improving credit portfolio quality and enhancing decision-making processes in digital banking institutions.

Keywords: credit scoring, machine learning, ensemble supervised learning, XGBoost, digital banking, NPL, approval rate