Abstract
With the rapid growth of online transactions, ensuring financial security has become increasingly important due to the rising sophistication of fraud risks. This study focuses on utilizing machine learning algorithms, specifically Random Forest, to detect fraud in online transactions. Random Forest is an ensemble learning method effective in handling large and complex data, capable of identifying fraud patterns that are challenging for conventional methods. The study applies the oversampling technique, SMOTE, to address data imbalance and enhance model performance. Evaluation results show that the Random Forest model achieves a high accuracy of 97.77% on training data and 97.04% on testing data. Precision on training data is 65.85%, decreasing to 52.89% on testing data, while recall remains high at 86.90% on testing data. The SMOTE technique provides a more balanced outcome with precision of 65.85%, recall of 86.90%, and F1 Score of 74.92% on testing data, compared to undersampling which results in lower precision and higher recall. These findings indicate that SMOTE-based oversampling significantly improves the stability and accuracy of fraud detection. The results suggest that machine learning techniques such as Random Forest, combined with appropriate sampling methods, can effectively enhance systems' ability to detect and prevent fraud in online transactions.

Keywords: *machine learning, fraud detection, random forest, online transaction*