

Credit Card Fraud Detection using Machine Learning

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Abstract: *The increased use of financial transactions on the internet has also enabled credit card fraud to flourish and challenge the credibility and reliability of electronic payment systems. Traditional rule-based approaches to detecting fraud have proved ineffective in detecting latent patterns of fraud that lead to high levels of false alarms and undetected fraud. This paper introduces a machine learning-based credit card fraud detection system using Logistic Regression and Random Forest classifiers. Both models are trained and tested on a massive Kaggle dataset comprising over 550,000 anonymized credit card transactions. Robust data preprocessing methods like normalization, encoding, and class balancing are utilized to enhance the performance of the models. The models are contrasted based on accuracy, precision, recall, and F1 score to evaluate their capacity to identify fraudulent transactions. Results show that the Random Forest algorithm gives improved performance, with 99.95% accuracy and 100% precision, due to its ensemble learning attribute that averts overfitting. Though simpler, Logistic Regression is a reasonable baseline with an interpretable output and fast computation. Ensemble-based models yield a scalable and more accurate fraud detection platform, as shown in the results. Future research explores the deep learning paradigms in federated learning for better privacy and real-time detection features to facilitate secure financial systems.*

Keywords: Credit Card Fraud Detection, Machine Learning, Support Vector Machine, k-nearest Neighbors, Decision Tree, Random Forest, Imbalanced Data

