

OPTIMIZING CREDIT CARD FRAUD DETECTION THROUGH MACHINE LEARNING ALGORITHMS EMPHASIZING PRECISION, RECALL, AND F1-SCORE METRICS

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Financial security is severely hampered by credit card fraud, which calls for effective detection methods. To assess the effectiveness of several machine learning algorithms in identifying credit card fraud, this article primarily looks at precision, recall, and F1-score measures as performance indicators. We evaluate the usefulness of Logistic Regression, Naive Bayes, AdaBoost, and gradient-boosting classifiers for fraud detection through an empirical investigation. According to our findings, Gradient Boosting performs better than other models in terms of precision and F1-score, indicating a higher probability of accurate fraud predictions. Although AdaBoost has the highest recall, there could be more false positives as a result. Compared to single-estimate models, the investigation shows that ensemble methods which incorporate many base estimators better reflect the intricacies of fraudulent transaction patterns. We talk about the practical ramifications of the trade-offs between false positives and false negatives. The study ends with suggestions for choosing an algorithm within the operational framework of a credit card firm that is particular to the cost dynamics of false positives and negatives. The study's conclusions are intended to improve fraud detection systems by striking a balance between minimising financial loss and upholding client happiness and confidence.