

# WEEK-04

## ACTIVITY-02

### CLASSIFICATION

#### CREDIT CARD FRAUD DETECTION

##### SYNOPSIS

Title: Credit Card Fraud Detection Using Machine Learning Algorithms

##### 1. Introduction:

This project aims to develop an efficient machine learning model for detecting credit card fraud, a growing issue that poses a serious threat to both financial institutions and consumers. The focus is on identifying fraudulent transactions with high accuracy while minimizing false positives.

##### 2. Context:

In the digital age, the volume of online transactions has surged, leading to an increase in credit card fraud. Traditional rule-based systems struggle to keep up with the sophisticated methods employed by fraudsters. Hence, there is a pressing need for advanced, data-driven approaches like machine learning to enhance fraud detection mechanisms.

##### 3. Main Subjects:

- Dataset: The project utilizes a large dataset of anonymized credit card transactions, where each transaction is labeled as either legitimate or fraudulent.
- Machine Learning Models: The study explores various algorithms including Logistic Regression, Decision Trees, Random Forests, and Neural Networks.
- Evaluation Metrics: Key metrics such as Accuracy, Precision, Recall, and F1-score are used to assess the performance of each model.

##### 4. Main Points:

- Problem Statement: The central challenge is to accurately detect fraudulent transactions in a highly imbalanced dataset, where fraudulent activities represent only a small fraction of all transactions.
- Methodology: The process involves data preprocessing, feature engineering, and training several machine learning models. Techniques like SMOTE (Synthetic Minority Over-sampling Technique) were applied to address the class imbalance issue.
- Findings: Among the models tested, the Random Forest algorithm demonstrated the best overall performance, achieving a high recall rate while maintaining reasonable precision. The Neural Network model, although more complex, provided slightly better accuracy but required more computational resources.
- Conclusion: The project successfully demonstrates that machine learning models can be effectively used to detect credit card fraud, with the Random Forest model showing the most promise for practical implementation.

##### 5. Conclusion:

The findings of this project suggest that implementing machine learning algorithms, particularly Random Forests, in credit card fraud detection systems can greatly improve the accuracy and efficiency of fraud detection efforts, offering better protection for consumers and reducing financial losses.