Project Report - Online Payments Fraud Detection Using Machine Learning

1. INTRODUCTION

1.1 Project Overview

This project detects fraudulent online payment transactions using supervised machine learning algorithms. The system analyzes transaction data and predicts whether a transaction is legitimate or fraudulent. The trained model is deployed using a Flask web application for real-time predictions.

1.2 Purpose

The purpose of this project is to reduce financial losses caused by online fraud by building an automated detection system that provides accurate and fast predictions.

2. IDEATION PHASE

2.1 Problem Statement

Online financial fraud is increasing rapidly with digital transactions. Manual detection methods are inefficient and time-consuming. An automated ML-based system is required to detect fraud effectively.

2.2 Empathy Map Canvas

Banks and payment platforms require accurate fraud detection systems to protect customers and reduce losses.

2.3 Brainstorming

Various approaches were considered including rule-based detection and ML classification models. Machine learning was selected due to higher accuracy and adaptability.

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

User enters transaction details → System processes input → Model predicts fraud → Result displayed.

3.2 Solution Requirement

Functional: Accept inputs, predict fraud, display results. Non-Functional: High accuracy, fast response time, user-friendly UI.

3.3 Data Flow Diagram

User → Flask UI → ML Model → Prediction Output

3.4 Technology Stack

Python, Pandas, NumPy, Scikit-learn, Seaborn, Matplotlib, Flask, Pickle.

4. PROJECT DESIGN

4.1 Problem Solution Fit

The ML model analyzes transaction attributes such as amount and balances to classify transactions accurately.

4.2 Proposed Solution

Data preprocessing, EDA, model training, evaluation, and deployment using Flask.

4.3 Solution Architecture

Dataset → Preprocessing → Model Training → Evaluation → Model Saving → Flask Integration.

5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Phases: Data Collection, Preprocessing, Model Training, Testing, Deployment, Documentation.

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

The model was evaluated using Accuracy, Precision, Recall, and F1 Score metrics and achieved strong performance.

7. RESULTS

7.1 Output Screenshots

Screenshots of the Flask UI, prediction results, and evaluation graphs are included.

8. ADVANTAGES & DISADVANTAGES

Advantages: Automated detection, high accuracy, real-time prediction. Disadvantages: Requires large dataset, possible false positives.

9. CONCLUSION

The project demonstrates a machine learning-based fraud detection system integrated with a web application for real-time prediction.

10. FUTURE SCOPE

Future improvements include cloud deployment, deep learning integration, and real-time streaming fraud detection.

11. APPENDIX

Source Code: Project repository. Dataset Link: Kaggle Online Payments Dataset. Project Demo: Local Flask Deployment.