Online Payments Fraud Detection using Machine Learning

1. INTRODUCTION

Project Overview: This project focuses on detecting fraudulent online payment transactions using Machine Learning techniques. Purpose: To reduce financial losses and enhance security in digital payment systems through intelligent fraud detection.

2. IDEATION PHASE

Problem Statement: Increasing online payment fraud leads to financial losses and reduced trust in digital systems. Empathy Map: Addresses concerns of customers, banks, and risk managers. Brainstorming: Identified key components such as transaction analysis, ML modeling, real-time detection, and dashboards.

3. REQUIREMENT ANALYSIS

Customer Journey Map: User initiates transaction → System analyzes → Fraud/Legitimate result → Alert if needed. Solution Requirement: Real-time classification, dashboard monitoring, secure data handling. Data Flow Diagram: User → Backend API → Preprocessing → ML Model → Database → Alert System. Technology Stack: Python, Flask/FastAPI, scikit-learn, pandas, MySQL/MongoDB.

4. PROJECT DESIGN

Problem-Solution Fit: Addresses delayed fraud detection and high false positives using ML models. Proposed Solution: Real-time ML-based fraud classification system. Solution Architecture: Modular layers including UI, Backend API, Preprocessing, ML Model, and Database.

5. PROJECT PLANNING & SCHEDULING

Project executed in Agile sprints covering data preparation, modeling, backend development, dashboard, and deployment.

6. FUNCTIONAL AND PERFORMANCE TESTING

Performance Testing: Measured accuracy, precision, recall, F1-score, ROC-AUC. System tested for real-time inference (<1 second response time).

7. RESULTS

Output includes fraud probability score and classification (Fraud/Legitimate). Dashboard displays fraud trends and flagged transactions.

8. ADVANTAGES & DISADVANTAGES

Advantages: Real-time detection, reduced losses, scalable architecture. Disadvantages: Requires quality historical data; model retraining needed for evolving fraud patterns.

9. CONCLUSION

The ML-based fraud detection system enhances online payment security by accurately identifying suspicious transactions in real-time.

10. FUTURE SCOPE

Integration with real-time streaming systems (Kafka), deep learning models, mobile alert systems, and cross-platform fraud intelligence.

11. APPENDIX

Source Code: Available in project repository. Dataset Link: Public credit card fraud dataset. GitHub & Project Demo Link: To be provided.