Phase-1

Guarding transactions with AI-powered credit card fraud detection and prevention

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1.Problem Statement

Credit card fraud Represent a significant financial and reputational risk for banks, merchants, and consumers. Fraudulent transactions of trust leads to substantial monetary losses and requires investigation and chargebacks. Traditional rule rule based coaches struggle to keep pace with evolving fraud patterns.

To solve this, we propose an AI drive system that continuously learns from transaction data to detect and prevent fraudulent activities in real time, imspproving accuracy and reducing false positives.

2.Objectives of the Project

Develop an AI model capable of identifying fraudulent credit card transactions with high precision and recall.

Reduce the rate of false positives to minimize disruption to legitimate customers.

Deploy a real-time scoring system that can flag suspicious transactions before authorization.

Provide interpretable insights and visualizations for fraud analysis to understand patterns an decision

3.Scope of the Project

Included Features:

- Real-time ingestion and scoring of transaction streams.
- Batch analysis of historical transaction dataset
- Dashboard for monitoring fraud metrics and model performance
- Alert generation for flagged transactions Limitations & Constraints:
- Use only publicly available or provided anonymized transaction dataset.
- Model department limited to a proof – of – concept web service
- Adherence to data privacy regulations; no of sensitive personal identifiers.

4 . Data Sources

Primary Dataset: kaggle "Credit Card Fraud Detection" dataset (public, static) containing anonymized features from European cardholders.

Supplementary Data: Synthetic transactions streams generated to simulate realtime behavior.

APLs: Optional integration with a mock payment gateway APL for end – to – testing.

5. High-Level Methodology

- **Data Collection** – Download the kaggle dataset.
  Generate synthetic transactions with controlled fraud injection

- **Data Cleaning** – Handle missing values via imputation or removal. Detect and remove duplicate records. Normalize or scale continuous features.

- **Exploratory Data Analysis (EDA)** – Visualize class imbalance and transaction distributions. Correlation heatmaps to identify redundant features.
  Time-series plots of transaction volumes.

- **Feature Engineering** – Create features such as transaction velocity (transactions per hour). Derive geographic or merchant category aggregates. Encode categorical variables via one- hot or target encoding.

- **Model Building** – Experiment with algorithms: Logistic Regression, Random Forest, Gradient Boosting (XGBoost), and Neural Networks

- **Model Evaluation** – Metrics: Precision, Recall,F1-Score, ROC-AUC, and PR-AUC. Cross-validation with time-based splits to mimic real-world deployment.

- **Visualization & Interpretation** – SHAP or LIME explanation for individual predictions. Dashboard charts: fraud rate over time, model score distributions.

- **Deployment** – Package the best model as a REST API using Flask or FastAPI. Deploy to a cloud service (e.g., Heroku) or local Docker container for demonstration.

6.Tools and Technologies

- **Programming Language** – Python.

- **Notebook/IDE** – Jupyter Notebook (development) & VS Code (API development).

- **Libraries** – Data processing: pandas, numpy

- **Optional Tools for Deployment** – Flask or FastAPI, Docker, Heroku(or equivalent)

7.Team Members and Roles

Team Member	Role & Responsibilities
Ganesh.M	Team Leader & Model Developer – Led the project, designed deep learning models, and managed overall workflow.
Priyanka sahoo	Data Analyst – Handled data preprocessing, normalization, and exploratory data analysis.
Sowmiya.G	Model Trainer & Evaluator – Focused on training/testing models, tuning hyperparameters, and evaluating results.
Ramya.G	Documentation Lead – Prepared project documentation, report writing, and presentation materials.
Harshni.M	Visualization & Research Support – Created visualizations, confusion matrices, and researched related works.