

PROJECT TITLE : EXPLAINABLE FRAUD ALERT SYSTEM

Domain:

Finance and Banking, Artificial Intelligence, Natural Language Processing

Abstract:

In today's digital banking landscape, the detection and prevention of fraudulent financial transactions are essential for maintaining customer trust and system security. However, while traditional fraud detection systems may flag anomalies effectively, they often lack transparency — leaving customers and bank officials confused or unconvinced about the reasons behind the alerts.

This project presents an **Explainable Fraud Alert System** that combines **behavior-based anomaly detection** with the power of **Google's Gemini AI** to generate simple, human-understandable explanations for flagged transactions. The system is designed to enhance trust, transparency, and user engagement by providing clear, context-aware reasoning behind fraud alerts.

The system comprises four key components:

1. **Behavior-Based Transaction Modeling:**

Using historical transaction data, the system applies machine learning (Isolation Forest) to learn patterns and detect anomalies based on transaction amount, location, and timing.

2. **Anomaly Detection Engine:**

When new transactions are analyzed, the engine identifies outliers that deviate from established user behavior, marking them as potentially fraudulent.

3. **Conversational NLP Explanation Module:**

Leveraging Gemini Pro (via Google Generative AI), the system translates technical anomalies into natural language explanations. These are delivered in simple terms to help users understand *why* a transaction may have been flagged.

4. **Trust-Based Scoring System:**

A dynamic scoring model assigns trust scores to each transaction, helping prioritize investigation and alert response.

The user interface is built using **Streamlit**, allowing seamless CSV uploads and visualization of flagged transactions, explanations, and trust scores.

This system represents a step toward **transparent AI** in fintech, offering both **explainability** and **accuracy** in fraud detection. By empowering customers and auditors with clear reasoning, the solution promotes trust, reduces false alarms, and streamlines fraud resolution processes.

Keywords:

Fraud Detection, Explainable AI, NLP, Gemini API, Anomaly Detection, Streamlit, Financial Security