AI-EBPL: Intelligent Fraud Detection in Financial Transactions

Overview

AI-EBPL is an advanced fraud detection system crafted for modern banks and fintech platforms. It intelligently monitors financial transactions, analyzes user behavior, detects anomalies in real-time, and secures key fraud-related decisions on the blockchain. By combining machine learning, behavioral analytics, explainable AI, and tamper-proof blockchain logging, AI-EBPL ensures fraud protection that is not only powerful but also transparent and trustworthy.

The Problem

As digital financial services evolve, so do the techniques employed by fraudsters. Traditional rule-based fraud detection systems often fall short when facing emerging fraud strategies, leading to high false positive rates and operational inefficiencies. These systems also lack the transparency required for today's regulatory and compliance standards, making it hard for institutions to justify or audit their fraud decisions.

Proposed Solution

AI-EBPL addresses these issues with a smart, explainable, and secure framework. It continuously learns from financial transaction data, identifies unusual behavior, assigns real-time risk scores, and stores critical fraud decisions on a blockchain for immutability and auditability. This integration of AI with blockchain not only improves fraud detection performance but also builds institutional trust by making every decision verifiable and tamper-proof.

Core Functionalities

AI-EBPL delivers real-time transaction monitoring by evaluating behavioral features like transaction frequency, location, login activity, and value. Its anomaly detection engine flags suspicious patterns such as sudden spending spikes, large value transfers, IP/login mismatches, and rapid access from different devices. A powerful XGBoost-based risk scoring engine classifies transactions into low, medium, or high risk, while SHAP (SHapley Additive exPlanations) ensures each classification is explainable and human-readable—empowering compliance teams with insights into why a transaction was flagged.

To guarantee trust and immutability, all flagged fraud cases are logged on a blockchain, along with metadata like timestamps, transaction IDs, risk scores, and hashed SHAP explanations. Additionally, the deployed ML model's hash is stored on-chain, allowing institutions to verify that fraud decisions were made using the authorized model version. Optionally, financial institutions can participate in a shared fraud registry on a permissioned blockchain, helping detect and respond to new fraud patterns collectively. An automated alerting system—powered by Twilio—ensures real-time SMS notifications are sent to administrators when high-risk activity is detected.

Technology Stack

Frontend: React.js (Dashboard)

Backend: FastAPI (REST API)

Machine Learning: XGBoost (Transaction Classification)

Explainability: SHAP (Model Transparency)

Blockchain: Ethereum or Hyperledger Fabric (Immutable Logging)

Smart Contracts: Record fraud alerts and model hashes

Blockchain Integration: Web3.py (Backend interaction)

Data Storage: IPFS (for SHAP outputs)

Alerts: Twilio API (SMS Notifications)

Visualization: SHAP plots, confusion matrix, Folium map

Dataset: IBM Synthetic Financial Dataset

Benefits

AI-EBPL helps institutions detect and block fraud in real time while ensuring audit-ready, tamper-proof documentation of each decision. It brings clarity through explainable AI, builds customer and regulatory trust, and allows for secure sharing of anonymized fraud signatures across institutions. The system also safeguards the integrity of both models and transactions against manipulation.

Team Lead Name: JAI GANESH H

Mail ID: jaig7335@gmail.com

Team Member 2: ABHISHAK TIMOTHY

Mail ID: abhishaktimothy@gmail.com

Team Member 3: DILLI BASKER M

Mail ID: dillibasker1@gmail.com

Team Member 4: LALETHESH S

Mail ID: lalhemsatmon01@gmail.com

Team Member 5: MOHAN B

Mail ID: mohanb07363@gmail.com

Team Member 6: JEGAN S

Mail ID: jegan1509s@gmail.com