**AI-Powered Fraud Detection Using AdaBoost with Random Forest**

**Overview**

This project aims to detect fraudulent transactions using an ensemble machine learning model, an AdaBoost classifier with a Random Forest as the base estimator. The dataset used in this project is the HSBC transaction dataset, which contains information about various financial transactions.

**Dataset**

The dataset used in this project is the `train\_hsbc\_df.csv` file. Which has the attributes regarding the transactions.

**Preprocessing**

The data preprocessing steps include:

1. Dropping irrelevant columns (**step, merchant, zipcodeOri, zipMerchant**).

2. Splitting the data into features (X) and target variable (y).

3. Identifying numeric and categorical columns.

4. Splitting the data into training and testing sets (80/20 split).

5. Imputing missing values in numeric columns using the mean and in categorical columns using the most frequent value.

6. Encoding categorical features using LabelEncoder.

7. Scaling the numeric features using MinMaxScaler.

**Model Training and Evaluation**

The machine learning model used in this project is an AdaBoost classifier with a Random Forest as the base estimator. The hyperparameters of the model were tuned to achieve the best performance.

The model was trained on the training data (given first), and its performance was evaluated on the test split(from the data). The accuracy score of the model is ***99.39%***

**Results**

The predictions made by the model are saved in a CSV file named **predictions.csv** in the Google Drive. The file contains two columns:

- **customer\_id**: The ID of the customer.

- **predicted\_fraud**: The predicted label of the transaction.

**Conclusion**

This project demonstrates the effectiveness of using an ensemble machine learning model, specifically an AdaBoost classifier with a Random Forest as the base estimator, for detecting fraudulent transactions. The model achieved an accuracy score of 99.39%, which is a promising result for real-world fraud detection applications.