University of Kalyani
Department of Computer Science and Engineering

a seminar on

Credit Card Fraudulent Transaction Detection

Presented by:
Mouli Dutta
Roll: 90/MCA No.: 220018

GUIDED BY:

PROFESSOR (DR.) KALYANI MALI

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Introduction

▶ Credit card fraud is a significant concern for both consumers and financial institutions.

▶ As online transactions become increasingly common, the need for robust fraud detection systems becomes more critical.

▶ In this project, we aim to develop a credit card fraud detection system using machine learning techniques to identify and prevent fraudulent transactions.

Objective

- Develop an efficient system for accurately detecting and preventing fraudulent credit card transactions in real-time.

- Key Goals:
  - Early Detection of Fraudulent Activities
  - Reduce False Positives
  - Adaptability to Evolving Fraud Patterns
  - Enhance Customer Trust
  - Cost Reduction for Financial Institutions and Customers

- Cybersecurity Application:
  - Enhance cybersecurity by effectively detecting and preventing fraudulent activities in financial transactions.

Tools and Technologies used
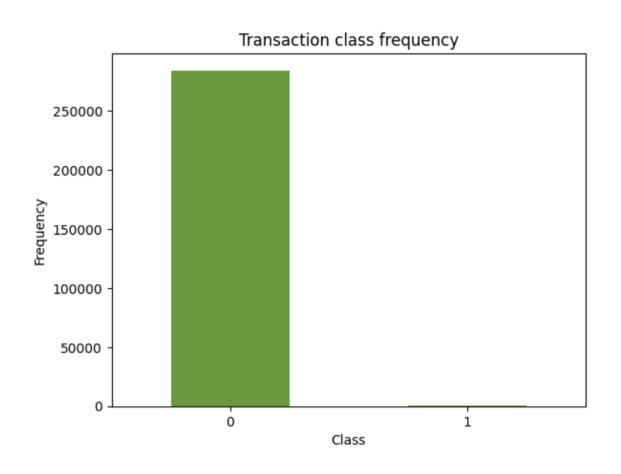
- Programming Language:
    - Python
- Libraries and Frameworks:
    - Scikit-learn
    - Pandas
    - NumPy
    - Matplotlib
    - Power BI
- Development Environment
    - Jupyter Notebook

Dataset

- Dataset Overview:

  - **Name:** Credit Card Fraud Detection dataset

  - **Source:** Kaggle

  - **Content:** Transactions made by credit cards in September 2013 by European cardholders

  - **Features:** 30 features (V1, V2, ..., V28) obtained using PCA, along with 'Time' and 'Amount'

  - **Target Variable:** 'Class'

  - **Class 0:** Non-fraudulent transactions (284,315 instances)

  - **Class 1:** Fraudulent transactions (492 instances)

  - **Total Instances:** 284,807

Dataset (Contd…)

Methodology

▶ <u>Data Preprocessing:</u>

1. The dataset is explored to understand its structure and characteristics.

2. Missing values are handled, and data types are converted as necessary.

3. The dataset is split into training and testing sets.

▶ <u>Feature Engineering:</u>

1. Feature engineering techniques are applied to extract relevant features from the dataset.

2. Dimensionality reduction techniques such as PCA (Principal Component Analysis) are used to reduce the number of features.

Methodology (Contd...)

▶ <u>Model Development:</u>

1. Various machine learning algorithms such as Logistic Regression, Random Forest, and Gradient Boosting are trained on the dataset.

2. The models are evaluated using performance metrics such as accuracy, precision, recall, and F1-score.

3. Hyperparameter tuning is performed to optimize the performance of the models.

Methodology (Contd...)

▶ Evaluation:

1. The performance of the models is evaluated using the testing dataset.
2. Confusion matrices and ROC curves are used to assess the performance of the models.
3. The model with the highest performance is selected as the final model for fraud detection.

Results

▶ After evaluating multiple machine learning models, the Gradient Boosting Classifier achieved the highest performance in terms of accuracy, precision, recall, and F1-score.

▶ The final model achieved an accuracy of 99.9%, with a precision of 92.7%, recall of 88.6%, and an F1-score of 90.6% on the testing dataset.

Conclusion

▶ In this project, I developed a credit card fraud detection system using machine learning techniques.

▶ The system demonstrates high accuracy and reliability in identifying fraudulent transactions, thus helping financial institutions in preventing financial losses due to fraud.

▶ This project demonstrates the effectiveness of machine learning in addressing real-world challenges and highlights its potential in enhancing security in financial transactions.

Future Scope

- The system can be further improved by exploring advanced machine learning algorithms and ensemble techniques.

- Continuous monitoring and updating of the model can help adapt to evolving fraud patterns.

- Integration with real-time transaction systems to provide instant fraud alerts and prevention measures.