MCA Final Year Project (Review I)

AI-Driven Fraud Detection: Securing Banking Transactions

Submitted to the Presidency University, Bengaluru in partial fulfillment for the award of the degree of Master of Computer Applications(MCA)

Project Number : 212

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Problem Statement

- **Rising Fraud Threat:** Financial fraud in banking leads to significant monetary losses and reduced customer trust.
- **Limitations of Current Systems:** Traditional rule-based methods fail to detect evolving fraud patterns, causing false positives and undetected fraud.
- **AI-Powered Detection** : Machine Learning models analyze transaction patterns in real time to identify anomalies and predict fraudulent activities.
- **Enhanced Security & Accuracy:** The AI-driven system improves fraud detection efficiency, minimizes false alarms, and secures banking transactions.

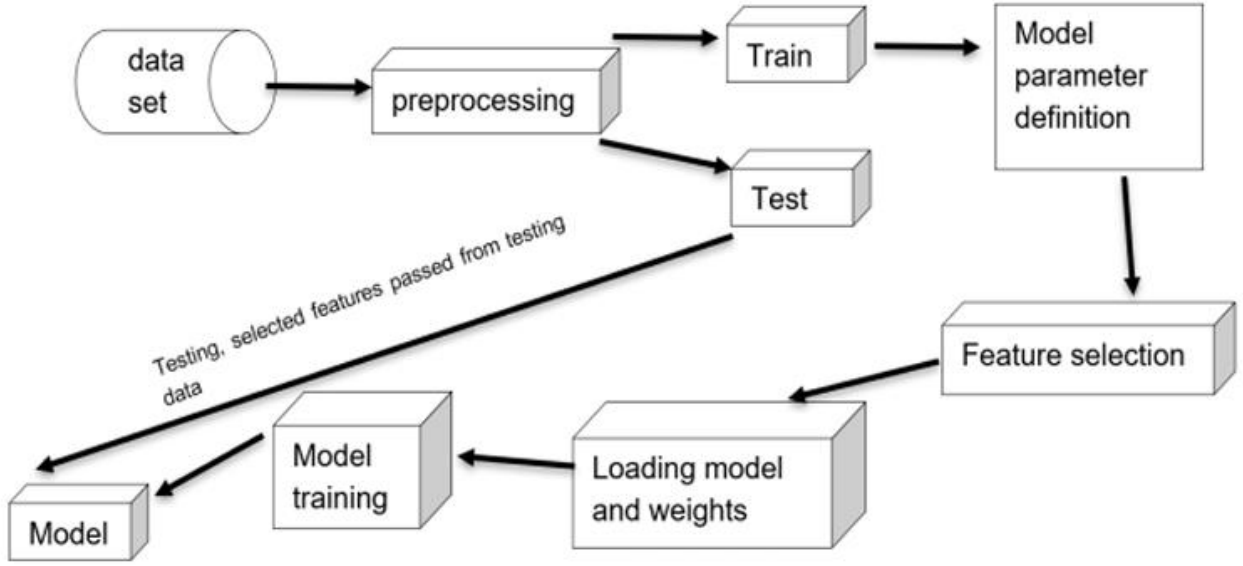
Literature Review

Sl. No.	Year	Authors	Title	Methodology	Advantages	Disadvantages
1	2024	Sharma et al.	Detecting Fraud in Banking Transactions	ML models (Random Forest, SVM, Decision Trees)	High accuracy, real-time detection	Data-dependent, needs updates
2	2022	Dubey S.	AI in Financial Fraud Detection	Neural networks, supervised learning	Improved accuracy, scalable	High cost, AI biases
3	2024	Talreja et al.	AI in Financial Fraud: A Survey	Review of AI fraud detection models	Broad coverage, method comparison	No experimental validation
4	2024	Patel R.	Forensic Accounting in Fraud Detection	AI-driven forensic accounting	AI + human expertise, large-scale cases	Requires expertise, costly
5	2025	Dalsaniya et al.	AI & RPA in Banking Fraud	RPA & AI-based predictive analytics	Automates fraud detection, fast	Complex setup, cybersecurity risks

Module Design

Brief overview of the project's modular architecture

The fraud detection system is designed using a modular architecture to ensure **scalability, efficiency, and flexibility**. Each module is responsible for a specific function, working together to detect fraudulent transactions in real time.



Modular Breakdown

Module 1: Data Analysis and Data Preprocessing

DATA ANALYSIS AND PREPROCESSING

```
[ ]  #import libraries
     import pandas as pd
     import numpy as np
     import matplotlib.pyplot as plt
     import seaborn as sns
     from imblearn.over_sampling import SMOTE
     from imblearn.under_sampling import NearMiss


     from sklearn.model_selection import train_test_split
     from sklearn.metrics import confusion_matrix, classification_report,accuracy_score
     from sklearn.linear_model import LogisticRegression
     from sklearn.neighbors import KNeighborsClassifier
     from sklearn.ensemble import RandomForestClassifier
     from sklearn.tree import DecisionTreeClassifier
     from sklearn.preprocessing import StandardScaler
     from sklearn import tree
     from matplotlib.colors import ListedColormap
     import sys
```

Importance:

- Improves model performance by reducing noise in data.

Module 2: Feature Engineering & Selection

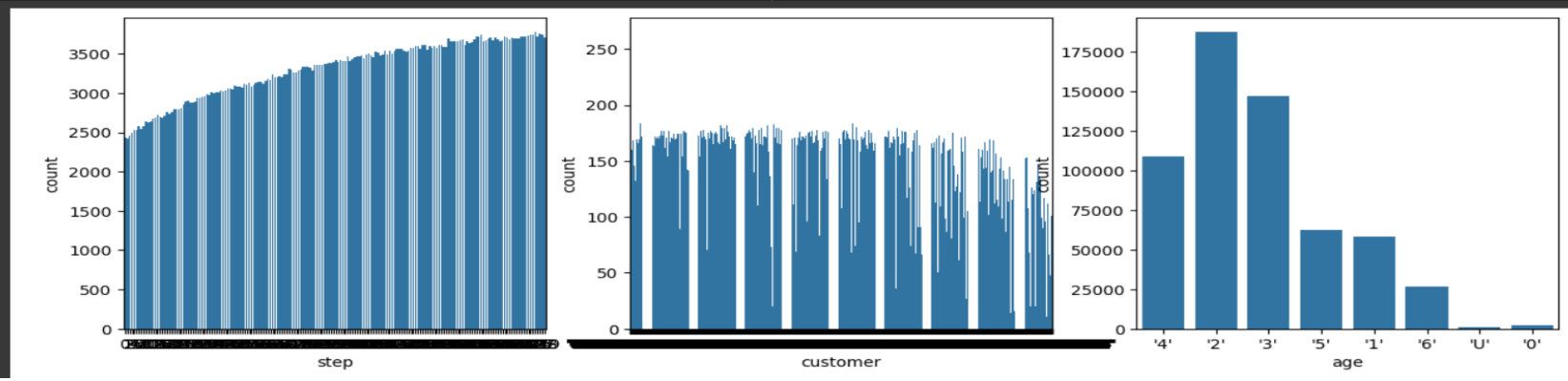
Functionality:

- Selects the most relevant features for fraud detection models.
- Uses statistical methods and ML techniques to enhance detection.

Importance:

- Improves fraud detection accuracy by refining critical features

```
features=['step','customer','age','gender','merchant','category','amount','fraud']
plt.figure(figsize=(15,30))
i=1
for j in range(8):
  plt.subplot(6,3,i)
  # The 'x' argument should specify the column to count, and 'data' should be the DataFrame.
  sns.countplot(x=features[j], data=dataset)
  i=i+1
```



Module 3: Machine Learning-Based Fraud Detection

```
[ ]  knn_cls=KNeighborsClassifier(n_neighbors=5,p=2)
     knn_cls.fit(X_train,y_train)
     y_pred=knn_cls.predict(X_test)
     cm = confusion_matrix(y_test, y_pred)
```

```
[ ]  classifier = DecisionTreeClassifier(criterion = 'entropy', random_state = 0)
     classifier.fit(X_train, y_train)
     y_pred = classifier.predict(X_test)
     cm = confusion_matrix(y_test, y_pred)
     print(cm)
     print("accuracy per=",accuracy_score(y_test,y_pred)*100)
```

```
[[117161    351]
 [   301   1116]]
accuracy per= 99.45177374736187
```

```
[ ]  rf=RandomForestClassifier(n_estimators=100,
            max_depth=8,random_state=42,verbose=1,
                        class_weight="balanced")
     rf.fit(X_train,y_train)
     y_pred=rf.predict(X_test)
     print("the confusion matrix is =")
     print(cm)
     print("accuracy per=",accuracy_score(y_test,y_pred)*100)
```

```
[ ] knn_cls=KNeighborsClassifier(n_neighbors=5,p=2)
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     y_pred=rf.predict(X_test)
     print("the confusion matrix is =")
     print(cm)
     print("accuracy per=",accuracy_score(y_test,y_pred)*100)
```

```
[Parallel(n_jobs=1)]: Done  49 tasks      | elapsed:   20.1s
[Parallel(n_jobs=1)]: Done  49 tasks      | elapsed:    0.2s
the confusion matrix is =
[[117161    351]
 [   301   1116]]
accuracy per= 96.1472811509388
```

Module 4: Rule-Based & Behavioral Analysis

Functionality:

- Implements predefined fraud rules (high-value transactions, unusual login locations).
- Uses user behavioral analytics to detect deviations from normal spending patterns.

Importance:

- Strengthens fraud detection by combining AI with traditional banking security measures.
- Reduces false positives by considering user habits.

Tools And Technologies To Be Used

1. Development Tools:

- **Google Colab / Jupyter Notebook** – used for coding, testing, and visualizing machine learning models.

2. Programming Language:

- **Python** – The predominant language for implementing machine learning models and data analysis in fraud detection systems..

3. Frameworks & Libraries:

- **Pandas & Numpy** – For data manipulation analysis and numerical computations.
- **Scikit-Learn --** Offers simple and efficient tools for predictive data analysis.
- **TensorFlow/Keras --** Used for building and training deep learning models.

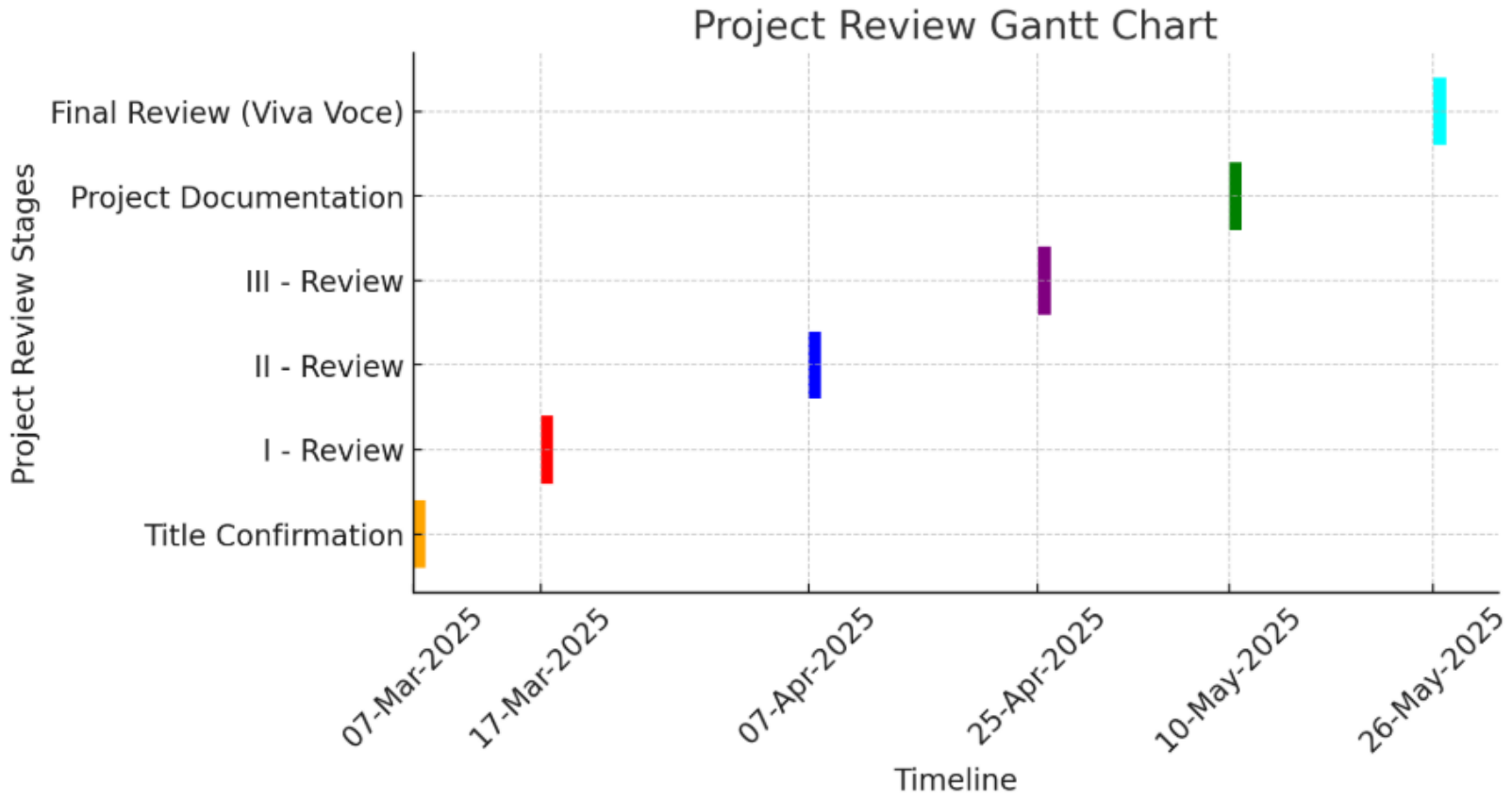
• 4. Additional Tools:

- **Matplotlib/Seaborn:** For creating static, animated, and interactive visualizations.

GITHUB LINK

- https://github.com/VijitaNayak/AI-Driven-Fraud-Detection-Banking-Transaction

Timeline of the Project



References

1. M. S. Islam and N. Rahman, "AI-Driven Fraud Detections in Financial Institutions: A Comprehensive Study," *Journal of Computer Science and Technology Studies*,vol. 7, no. 1, pp. 100–112, 2025.
2. S. Dubey, "Artificial Intelligence in Financial Fraud Detection " *Innovative Research Thoughts*, vol. 8, no. 4, 2022.
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4. A. Dalsaniya, K. Patel, and P. R. Swaminarayan, "Challenges and Opportunities: Implementing RPA and AI in Fraud Detection in the Banking Sector," *World Journal of Advanced Research and Reviews*, vol. 25, no. 01, pp. 296–308, 2025.
5. S. Kalisetty, C. Pandugula, L. R. K. Sondinti, G. Mallesham, and P. R. S. Rani, "AI-Driven Fraud Detection Systems: Enhancing Security in Card-Based Transactions Using Real-Time Analytics," *Journal of Electrical Systems*, vol. 20, no. 11s, 2024.


Thank
You!