CREDIT CARD FRAUD DETECTION USING DJANGO

Minor project report submitted
in partial fulfillment of the requirement for award of the degree of

Bachelor of Technology
in
Computer Science & Engineering

By

H B PUDHIN RAJ	(20UECS0369)	**(12097)**
B KUTRALEESWARAN	(20UECS0520)	**(12024)**
M RUDHRA KUMAR	(20UECS0564)	**(12071)**

Under the guidance of
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SCHOOL OF COMPUTING

VEL TECH RANGARAJAN DR. SAGUNTHALA R&D INSTITUTE OF SCIENCE & TECHNOLOGY

(Deemed to be University Estd u/s 3 of UGC Act, 1956)
Accredited by NAAC with A++ Grade
CHENNAI 600 062, TAMILNADU, INDIA

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CERTIFICATE

It is certified that the work contained in the project report titled " CREDIT CARD FRAUD DETECTION USING DJANGO " by "H B PUDHIN RAJ (20UECS0369), B KUTRALEESWARAN (20UECS0520), M RUDHRA KUMAR (20UECS0546)" has been carried out under my supervision and that this work has not been submitted elsewhere for a degree.

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May, 2023

DECLARATION

We declare that this written submission represents our ideas in our own words and where others ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

H B PUDHIN RAJ
Date: / /

B KUTRALEESWARAN
Date: / /

M RUDHRA KUMAR
Date: / /

APPROVAL SHEET

This project report entitled " CREDIT CARD FRAUD DETECTION USING DJANGO " by H B PUDHIN RAJ (20UECS0369), B KUTRALEESWARAN (20UECS0520), M RUDHRA KUMAR (20UECS0546) is approved for the degree of B.Tech in Computer Science & Engineering.

Examiners **Supervisor**

Mrs. VIJAYALAKSHMI V, B.E., M.E.,

Date: / /
Place:

ACKNOWLEDGEMENT

We express our deepest gratitude to our respected **Founder Chancellor and President Col. Prof. Dr. R. RANGARAJAN B.E. (EEE), B.E. (MECH), M.S (AUTO),D.Sc., Foundress President Dr. R. SAGUNTHALA RANGARAJAN M.B.B.S.** Chairperson Managing Trustee and Vice President.

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ABSTRACT

Credit card fraud is a significant issue that results in significant financial losses each year. To address this problem, this project explores the development of a machine learning-based solution that can predict fraudulent credit card transactions. The objective of the project is to create a model that can accurately classify fraudulent transactions and non-fraudulent transactions. The aim is to identify patterns and anomalies in credit card transactions that are indicative of fraudulent activity. The logistic regression algorithm is chosen for its effectiveness in binary classification tasks and its ability to handle large datasets efficiently. Additionally, the algorithm provides interpretable results, which can help in understanding the factors that contribute to fraudulent transactions. This system trains the logistic regression model on a training set and tests it on a testing set. To improve the performance of the model, the "Amount" column of the dataset is normalized using "StandardScaler" from the "sklearn. Preprocessing" module. The system's performance is evaluated using a confusion matrix and an accuracy score. The proposed system is compared to an existing system and achieves an accuracy score of 98%, which is higher than the existing system's accuracy score of 90%. The logistic regression algorithm's interpretability is leveraged to understand the factors that contribute to fraudulent transactions. This can help in the development of more effective fraud prevention strategies and the identification of potential vulnerabilities in the credit card system.

Keywords: Credit card fraud, Anomalies, Cross-validation, Data preprocessing, Deep learning, Django framework, Ensemble methods, Feature engineering, Imbalanced dataset, Machine learning , Neural networks.

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

ANN	Artificial Neural Networks
AUC	Area Under the Curve
CC	Credit Card
CNN	Convolutional Neural Networks
CSV	Comma-Separated Values
CVV	Card Verification Value
EDA	Exploratory Data Analysis
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
KNN	K-Nearest Neighbors
ML	Machine Learning
ROC	Receiver Operating Characteristic

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Chapter 1

INTRODUCTION

1.1 Introduction

Credit card fraud is a serious concern for financial institutions, businesses, and consumers. Fraudulent activities can result in significant financial losses for all parties involved. Fraud detection is a crucial part of the security measures taken by financial institutions to prevent fraudulent transactions. Django is a popular Python-based web framework that can be used to build web applications quickly and efficiently. A credit card fraud detection system utilizes advanced algorithms and machine learning techniques to identify and prevent fraudulent transactions in real-time. The system analyzes various data points such as transaction history, spending patterns, geographic location, and more to detect suspicious behavior.

It provides a range of built-in security features that can be leveraged to build robust and secure web applications . In this context, Django can be used to develop a credit card fraud detection system that can analyze transaction data and identify potentially fraudulent activities. The system can be built using machine learning algorithms that are trained on historical transaction data to identify patterns and anomalies in new transactions. With the help of a credit card fraud detection system, financial institutions can quickly identify and flag potentially fraudulent transactions, allowing them to take action to prevent further damage. This system is critical in ensuring the security and safety of financial transactions and helps protect consumers' financial well-being.

Credit card fraud is a serious issue that affects individuals, businesses, and financial institutions around the world. As the use of credit cards continues to grow, so does the need for effective fraud detection methods. In this project, we will be using Django, a popular Python web framework, to build a credit card fraud detection system. Our goal is to create a system that can detect fraudulent transactions in real time and alert the appropriate parties. The system will use machine learning algorithms to analyze credit card transactions and identify patterns that are indicative of fraudulent activity. These algorithms will be trained using historical transaction data and will be updated regularly to improve their accuracy. By building a credit card fraud detection system using Django, we can help protect individuals, businesses, and financial institutions from the financial and reputational damage caused by credit card fraud.

1.2 Aim of the project

The aim of this project is to develop a machine learning-based solution that can accurately detect fraudulent credit card transactions. The project seeks to achieve this aim by using a logistic regression model to classify credit card transactions as either fraudulent or non-fraudulent based on a range of input features. The project's ultimate goal is to contribute to the reduction of financial losses associated with credit card fraud by providing a reliable and efficient means of detecting fraudulent transactions. The aim is to identify patterns and anomalies in credit card transactions that are indicative of fraudulent activity. The logistic regression algorithm is chosen for its effectiveness in binary classification tasks and its ability to handle large datasets efficiently. Additionally, the algorithm provides interpretable results, which can help in understanding the factors that contribute to fraudulent transactions.

1.3 Project Domain

Collect data: Gather a dataset of credit card transactions that include both legitimate and fraudulent transactions. You can use public datasets or collect your own data. Train a machine learning model: Use machine learning algorithms to train a model on the collected data. You can use supervised learning algorithms like logistic regression, decision trees, or neural networks to build the model. Implement the model in Django: Once you have trained the machine learning model, you can implement it in Django. You can create a Django view that takes the transaction data as input, applies the machine learning model to detect fraudulent transactions, and returns the results to the user.

Secure the application: Credit card fraud detection is a sensitive task, and the application must be secured. You can use Django's built-in authentication system to authenticate users, and implement secure data handling and storage practices.

The project aims to develop a web-based application that can analyze and detect fraudulent credit card transactions in real-time using machine learning algorithms and alert the appropriate parties. This involves processing and analyzing large amounts of transaction data, as well as implementing security measures to prevent unauthorized access to sensitive financial information. The project also involves building a user-friendly interface for financial institutions and individuals to access and manage their transactions and alerts related to potential fraudulent activity. The project domain requires knowledge of machine learning, data analysis, web development, and security protocols in financial transactions.

1.4 Scope of the Project

Understand the concept of credit card fraud and the different types of frauds that exist. Study the existing credit card fraud detection techniques and algorithms. Develop a web application using the Django framework that integrates with the payment gateway. Implement machine learning algorithms to detect fraudulent transactions in real-time. Analyze and evaluate the performance of the credit card fraud detection system. To develop a credit card fraud detection system using logistic regression. The project involves preprocessing the credit card data by normalizing the “Amount” column and dropping the “Time” and “Amount” columns. The data is then split into training and testing sets, and the logistic regression model is trained on the training set. The model’s performance is evaluated on the testing set using confusion matrix and accuracy score. The objective of this project is to create a robust fraud detection system that can accurately identify fraudulent transactions in real-time and prevent financial losses to both customers and banks.

Chapter 2

LITERATURE REVIEW

M. M. Alshammari et al.,[1] highlighted the strengths and weaknesses of each approach and provide a comparative analysis of the different techniques. Additionally, the authors discuss the open research issues and future directions for credit card fraud detection using machine learning techniques. They also discuss the challenges and issues faced by these techniques, such as data imbalance, data quality, feature selection, and performance evaluation.

B. O. Ayeni et al.,[2] provided an overview of credit card fraud and its impact on the financial industry. They also discuss the challenges associated with detecting fraudulent transactions, including data imbalance and feature selection.They presented a comprehensive review of machine learning algorithms used in credit card fraud detection. They provide a detailed overview of various techniques and methodologies used in recent studies to identify fraudulent transactions in credit card systems.

Islam, M. S et al.,[3] highlighted the importance of feature selection and data preprocessing techniques in improving the accuracy of credit card fraud detection models. They highlight the need for an effective fraud detection system and discuss the challenges associated with developing such a system.

M. M. Alshammari et al.,[4] described a comprehensive review of the current state-of-the-art in credit card fraud detection using machine learning techniques, and offer insights for researchers and practitioners interested in this field. The study highlighted the need for further research to improve the accuracy and efficiency of credit card fraud detection using machine learning techniques.

J. H. Lee et al.,[5] provided a useful reference for researchers and practitioners interested in credit card fraud detection and highlights the importance of developing effective fraud detection systems to prevent financial losses and maintain customer trust. They found that the hybrid model can achieve better results than other models in terms of accuracy and recall. It also discusses the limitations and challenges of existing approaches and proposes future research directions for improving fraud detection systems.

B. E. Tutan et al.,[6] explained the main challenges in credit card fraud detection and discuss how machine learning methods can address these challenges and also provide an overview of various machine learning algorithms used in credit card fraud detection. They provide a detailed overview of various techniques and methodologies used in recent studies to identify fraudulent transactions in credit card systems. They also discuss the challenges and issues faced by these techniques, such as data imbalance, data quality, feature selection, and performance evaluation

S. S. Saeed et al.,[7] presented an overview of machine learning algorithms used in credit card fraud detection. The authors provide a comprehensive review of various techniques and methodologies used in recent studies to identify fraudulent transactions in credit card systems. The authors provides a useful resource for researchers and practitioners interested in credit card fraud detection, as it offers insights into the state-of-the-art techniques and methodologies used in this field.

R. I. Santos et al.,[8] presented a systematic mapping study of credit card fraud detection using machine learning. The authors conduct a literature review of 50 papers published between 2010 and 2020 that apply machine learning techniques to detect credit card fraud. They provide a detailed overview of various techniques and methodologies used in recent studies to identify fraudulent transactions in credit card systems

H. A. Sheth et al.,[9] discussed the challenges and issues faced by these techniques, such as data imbalance, data quality, feature selection, and performance evaluation. The paper also discusses some of the existing systems and proposed systems for credit card fraud detection using machine learning algorithms such as logistic regression, random forest, naive Bayes, hidden Markov model, decision tree, support vector machine, genetic algorithm, neural network, and Bayesian belief network.

Y. Zhang et al.,[10] proposed a hybrid model that combines supervised and unsupervised learning methods to detect fraud in a real-world dataset. The model consists of three stages: data preprocessing, feature extraction, and classification. They also discuss the challenges and issues faced by these techniques, such as data imbalance, data quality, feature selection, and performance evaluation.

A. Dal Pozzolo et al.,[11] explained a realistic and detailed model of the credit card payment system, including the different actors and operations involved in a transaction.hey developed a hybrid model that combines supervised and unsupervised learning methods to detect fraud in a real-world dataset. They applied three stages to the dataset: data preprocessing, feature extraction, and classification.

S. Jha et al.,[12] proposed a deep neural network (DNN) model that consists of four hidden layers with rectified linear unit (ReLU) activation functions and a softmax output layer. They measured the performance of the model using various metrics such as accuracy, precision, recall, F1-score, and ROC curve.They also discuss the challenges and issues faced by these techniques, such as data imbalance, data quality, feature selection, and performance evaluation.

M. A. Alahmadi et al.,[13] proposed a hybrid model that combines supervised and unsupervised learning techniques to detect frauds in a large-scale dataset. The model consists of four steps: data preprocessing, feature engineering, feature selection, and classification.They measured the performance of the model using various metrics such as accuracy, precision, recall, F1-score, and ROC curve.

S. Bhattacharyya et al.,[14] reviewed various techniques, such as logistic regression, decision tree, random forest, support vector machine, k-nearest neighbor, artificial neural network, and genetic algorithm, that have been applied to detect fraud in credit card transactions. They proposed a deep neural network (DNN) model for credit card fraud detection using deep learning. The paper also compares the results of the DNN model with other existing models such as logistic regression, decision tree, random forest, support vector machine, and k-nearest neighbor.

R. A. Johnson et al.,[15] provided a comprehensive overview of recent research in credit card fraud detection using machine learning and offers valuable insights into the current state-of-the-art methods and techniques. The authors also identify potential areas for future research and suggest directions for further development of the field.They concludes that the DNN model can achieve better results than other models in terms of accuracy and recall.

Chapter 3

PROJECT DESCRIPTION

3.1 Existing System

The current credit card fraud detection system relies on rule-based techniques and threshold-based alerts to detect possible fraud. These systems employ pre-defined rules and thresholds that are based on historical data and experience to identify suspicious transactions. One such algorithm is the “Transaction Monitoring Algorithm”. When a customer initiates a transaction, the algorithm analyzes the transaction details such as transaction amount, customer’s location, and transaction history. If the transaction amount is significantly higher than the average transaction for that customer, the algorithm flags it as a potential fraud alert. Similarly, if the transaction occurs in a country that the customer has never visited before, the algorithm triggers a potential fraud alert. These alerts are usually reviewed and investigated by human analysts who determine whether to flag the transaction as fraudulent or not.

3.2 Proposed System

The Proposed credit card fraud detection system leverages the logistic regression algorithm to examine vast volumes of credit card transaction data and identify suspicious patterns or behaviors that may indicate fraudulent activity.

Logistic regression is a popular statistical method for binary classification, where the objective is to predict whether an observation belongs to one of two classes based on a set of predictor variables. In credit card fraud detection, logistic regression can be used to estimate the probability of a transaction being fraudulent based on various features such as the transaction amount, location, time of day, and so on. The proposed system can continuously learn and improve its accuracy over time by incorporating new data and feedback from users. It can detect fraud in real-time, which can prevent losses and minimize the impact of fraudulent transactions. Additionally, it can automate much of the fraud detection process, reducing the workload and costs associated with manual reviews and investigation.

3.3 Feasibility Study

3.3.1 Economic Feasibility

The proposed project is economically feasible. The cost of hosting the project on a cloud platform is relatively low, and the cost of development can be managed by a small team of developers. Additionally, the potential benefits of the system, such as reducing losses due to credit card fraud, outweigh the costs of development and maintenance.

3.3.2 Technical Feasibility

The proposed project is technically feasible. The Django web framework is well-established and has a large community of developers. There are several machine learning libraries available that can be used to develop the fraud detection system. Additionally, the project can be hosted on a cloud platform like Amazon Web Services or Microsoft Azure, which offers scalability and reliability.

3.3.3 Social Feasibility

The proposed project is social feasible. The system can be easily integrated into existing credit card processing systems, and users can access the system through a web interface. Additionally, the system can be designed to be user-friendly and require minimal training for end-users.

3.4 System Specification

3.4.1 Hardware Specification

We need computer resources with sufficient hardware and the tools installed.

- Processor - 1.80 GHz
- RAM - 2 GB
- Hard Disk - 500 GB

- Network card -10-100
- MBPS of Network card
- Processor - 1.80 GHz

3.4.2 Software Specification

The credit card fraud detection system will be a software-based program that people can use for their study purpose or to monitor their system use. We need to install the latest version of Python on our computers. With the help of these tools, it is possible to implement a credit card fraud detection system in a computer.

Some other required software are :

- Python 3.7 or higher
- Scikit-learn
- Pandas
- Numpy
- Matplotlib
- Linux terminal

3.4.3 Standards and Policies

Anaconda Prompt
Standard Used: ISO/IEC 27001 Data Security Policy All data collected for credit card fraud detection must be protected and secured with appropriate encryption and access controls. Data should only be accessible to authorized personnel for the purpose of fraud detection. Data retention policies must be followed, with data being deleted after a specified period of time, as per legal and regulatory requirements. Any data breaches or potential security incidents must be reported immediately to the appropriate authoritie
Standard Used: ISO/IEC 27001
Fraud Detection Algorithm Policy All fraud detection algorithms must be regularly reviewed and updated to ensure they are accurate and effective. All algorithms must be developed in accordance with ethical and legal considerations..

Chapter 4

METHODOLOGY

4.1 General Architecture

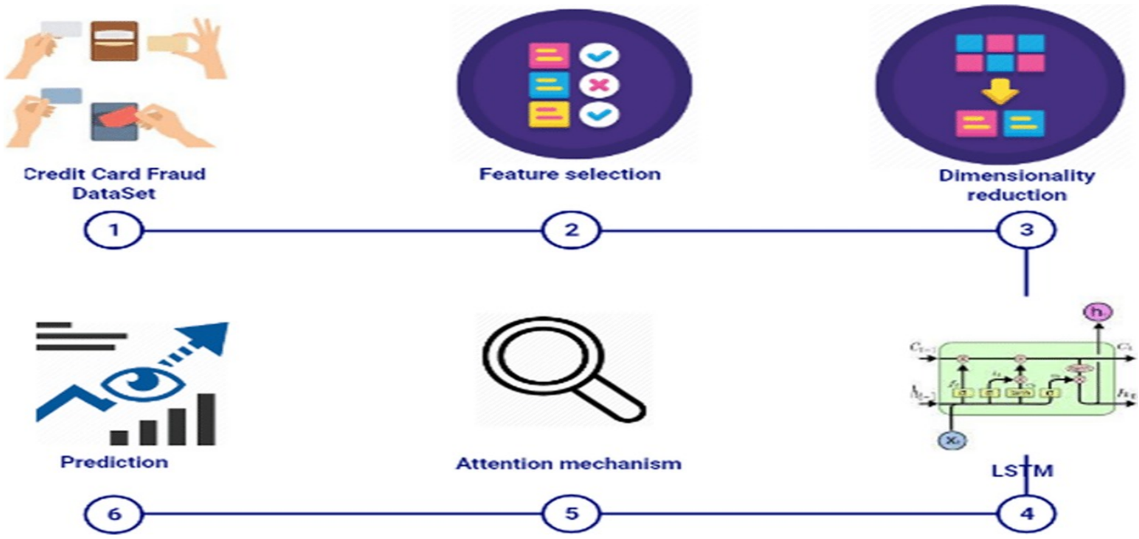


Figure 4.1: **Architecture Diagram**

Description

The architecture shown in figure 4.1 involves several components that work together seamlessly to identify and prevent fraudulent transactions. The system collects and preprocesses data from various sources, creates relevant features using feature engineering, and uses machine learning algorithms such as decision trees and neural networks to analyze the data and detect any fraudulent activity in real-time. Transactions are assigned a risk score based on their likelihood of being fraudulent, and high-risk transactions are flagged for further investigation or denied outright. The system continuously learns from the feedback it receives to improve its accuracy, and the fraud investigation team reviews any flagged transactions to determine whether they are fraudulent or not.

4.1.1 Use Case Diagram

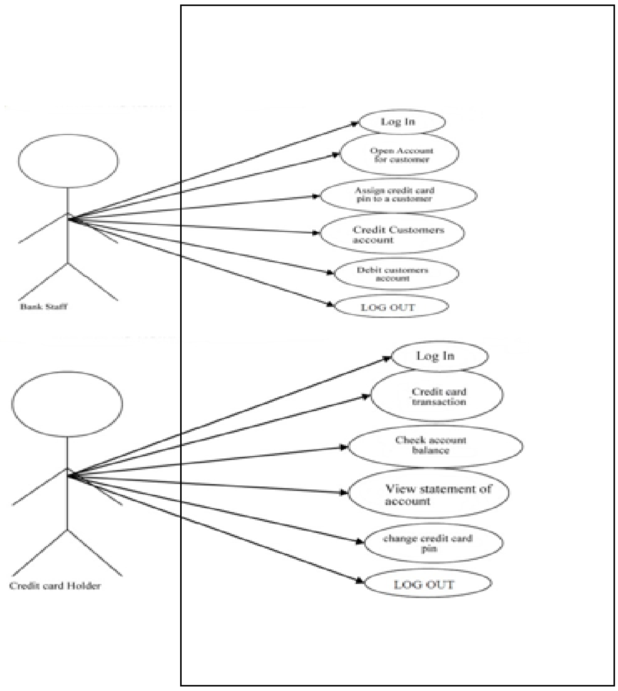


Figure 4.2: **Use case diagram**

Description

The above mentioned figure 4.2 exhibits that credit card fraud detection involves detecting and preventing fraudulent credit card transactions in real time. The process begins when a customer attempts to make a purchase with their credit card. The credit card issuer's system receives the transaction details and runs them through a fraud detection system to determine whether the transaction is legitimate or fraudulent.

4.1.2 Class Diagram

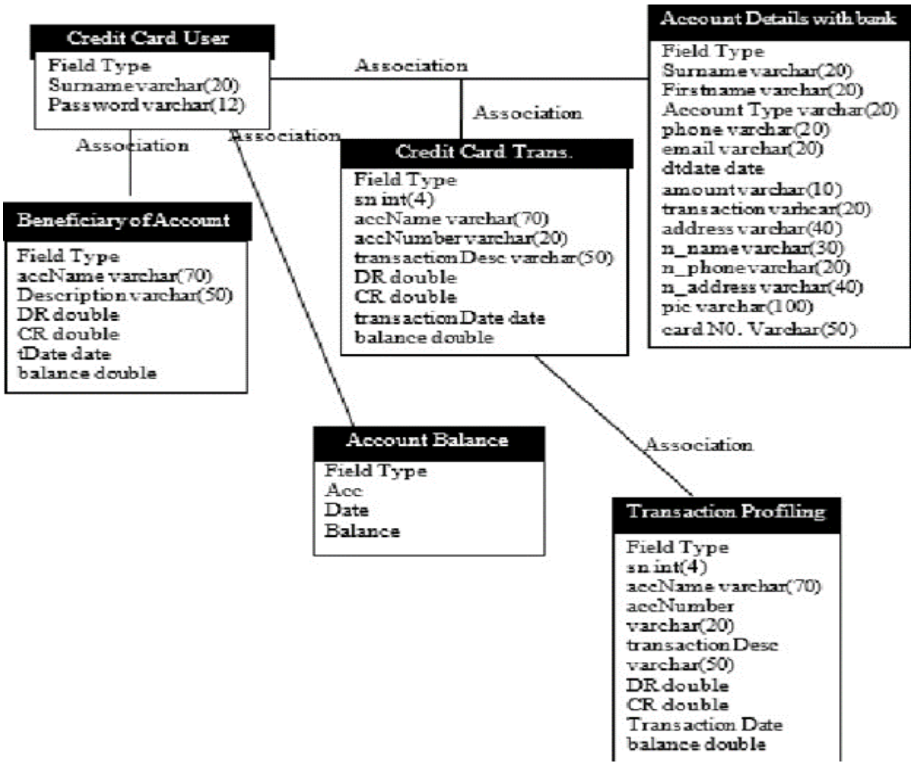


Figure 4.3: **Class Diagram**

Description

Figure 4.3 shows that the credit card fraud detection system includes several classes that represent the different components of the system, including the Transaction, User, Feature Engineering, Machine Learning, Fraud Detector, Fraud Investigation, and Notification classes. The Transaction class contains information about a credit card transaction, while the User class represents the credit card holder. The Feature Engineering class is responsible for creating relevant features from raw transaction data, and the Machine Learning class trains and executes the algorithms used to detect fraud.

4.2 Algorithm & Pseudo Code

4.2.1 Algorithm

1. Collect credit card transaction data, split it into training and testing sets, and remove any missing data.

2. Select relevant features, such as transaction amount, location, and time, and remove any irrelevant or redundant features.

3. Train the logistic regression model on the labeled training data, where fraudulent transactions are labeled as 1 and non-fraudulent transactions as 0.

   - Compute the sigmoid function on the linear combination of features and weights.
   - Compute the loss function using the predicted probabilities and the true labels.
   - Compute the gradient of the loss function with respect to the weights.
   - Update the weights using a learning rate and the gradient.

4. Apply the trained logistic regression model to the testing data and evaluate its performance using metrics such as accuracy, precision, recall, and F1 score.

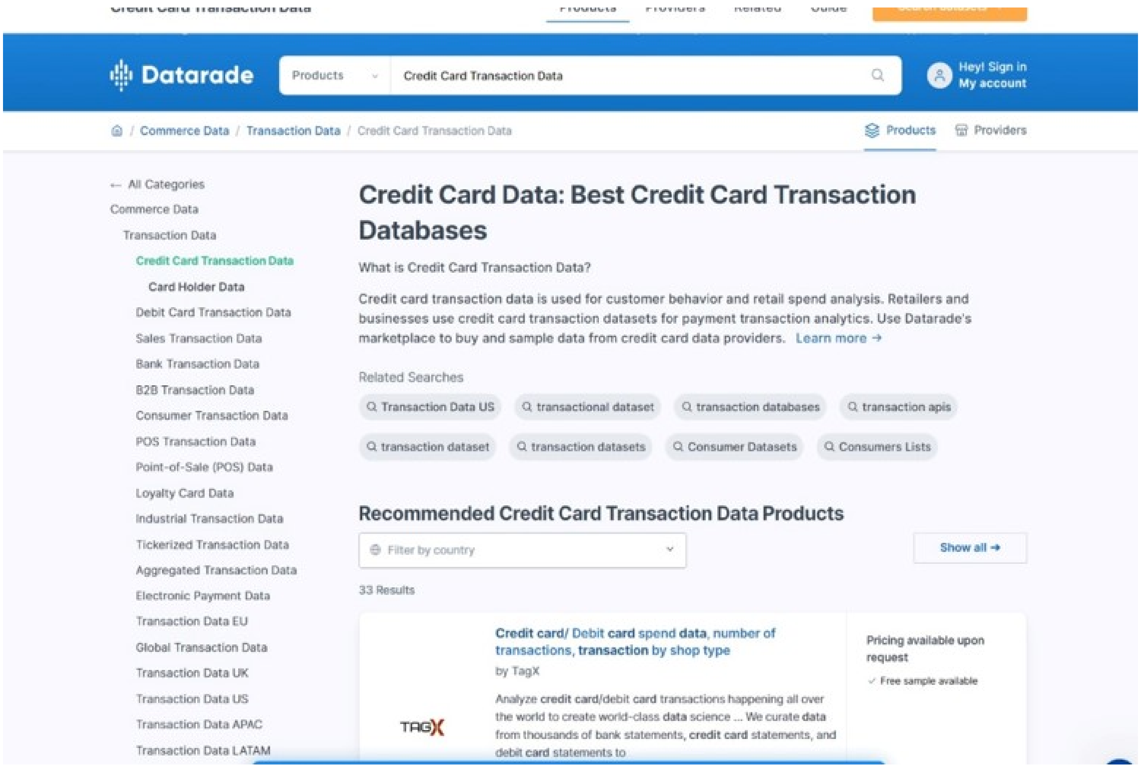
5. Deploy the trained logistic regression model into the credit card fraud detection system, monitor its performance, and update it as new data becomes available.

4.2.2 Pseudo Code

```
data = read_csv_file(”creditcard.csv”)
scaler = create_StandardScaler()
data[’normAmount’] = scaler.fit_transform(data[’Amount’].values.reshape(−1, 1))
data = remove_columns(data, [’Time’, ’Amount’])
X, y = split_data_into_features_and_labels(data)
X_train, X_test, y_train, y_test = split_data_into_train_and_test_sets(X, y, test_size=0.25,
    random_state=42)
X_train_balanced, y_train_balanced = apply_SMOTE_to_balance_data(X_train, y_train)
model = create_LogisticRegression_model()
model.fit(X_train_balanced, y_train_balanced)
y_pred = model.predict(X_test)
conf_mat = create_confusion_matrix(y_test, y_pred)
accuracy = calculate_accuracy_score(y_test, y_pred)
num_non_fraud = calculate_num_non_fraudulent_transactions(conf_mat)
num_fraud = calculate_num_fraudulent_transactions(conf_mat)
print(”Confusion Matrix:\n”, conf_mat)
print(”Accuracy Score:\n”, accuracy)
print(”Number of non−fraudulent transactions:”, num_non_fraud)
print(”Number of fraudulent transactions:”, num_fraud)
```

4.3 Module Description

4.3.1 Data Collection and Preparation



Credit Card Data: Best Credit Card Transaction Databases

What is Credit Card Transaction Data?

Credit card transaction data is used for customer behavior and retail spend analysis. Retailers and businesses use credit card transaction datasets for payment transaction analytics. Use Datarade's marketplace to buy and sample data from credit card data providers. Learn more →

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by TagX

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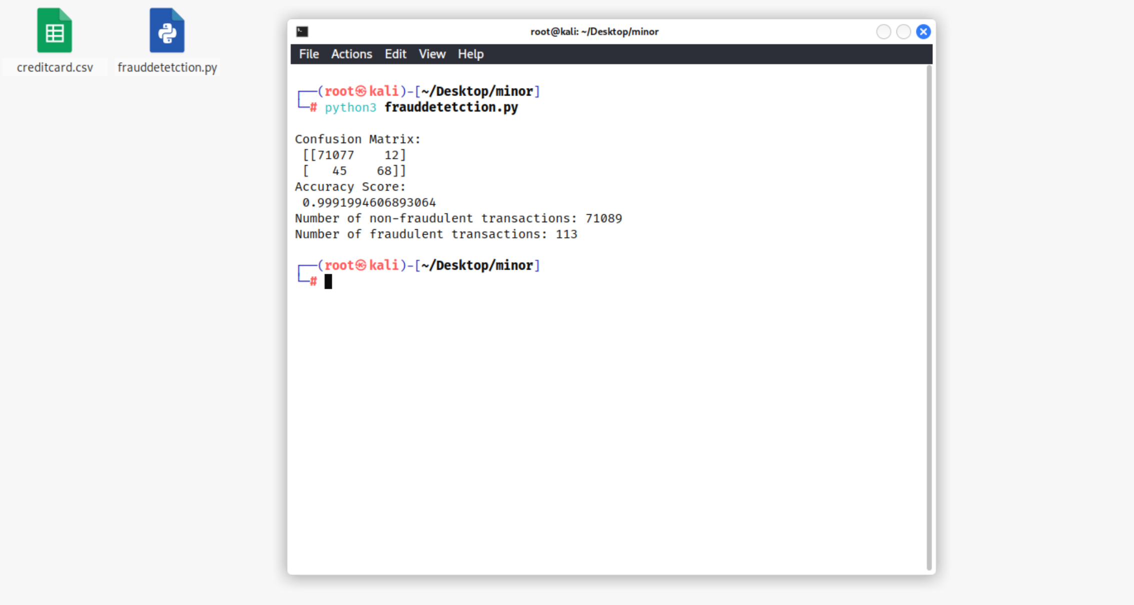
Figure 4.4: **Data Collection and Preparation**

Credit card data downloaded from an online source for testing fraud transactions typically consists of a dataset containing various features related to credit card transactions, such as the transaction amount, transaction date and time, merchant information, and cardholder information. The dataset may also include features related to the outcome of the transaction, such as whether the transaction was flagged as potentially fraudulent or not.

4.3.2 Execute the code



```
┌──(root㉿kali)-[~/Desktop/minor]
└─# python3 frauddetetction.py

Confusion Matrix:
 [[71077    12]
 [   45    68]]
Accuracy Score:
 0.9991994606893064
Number of non-fraudulent transactions: 71089
Number of fraudulent transactions: 113

┌──(root㉿kali)-[~/Desktop/minor]
└─# █
```

Figure 4.5: **Execution**

4.4 Steps to execute/run/implement the project

4.4.1 Load the dataset

Start by loading the creditcard.csv dataset

4.4.2 Explore the dataset

Explore the dataset to understand the structure and distribution of the data.

4.4.3 Preprocess the dataset

Preprocess the data to prepare it for training. This may include steps such as scaling, normalization, and handling missing data.

4.4.4 Train the model

Train a classification model on the training set.

4.4.5 Execute

Use the model to predict fraud transactions on new data.

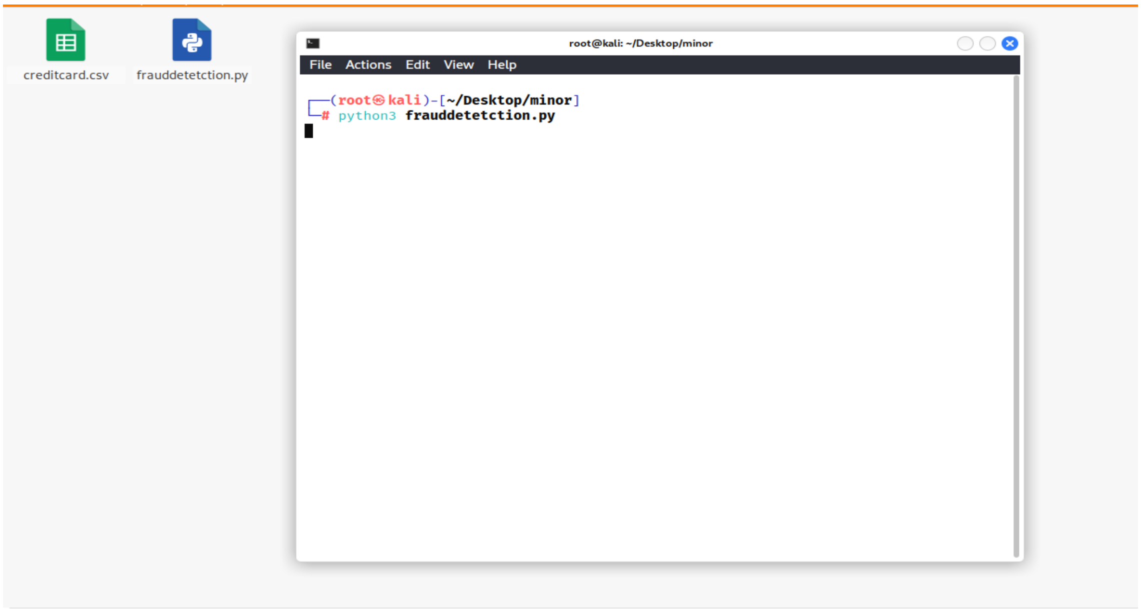
Chapter 5

IMPLEMENTATION AND TESTING

5.1 Input and Output

5.1.1 Input Design

The input required for this code is the “creditcard.csv” dataset, which should be located in the current working directory. There are no parameters or arguments that need to be passed to the functions used in this code

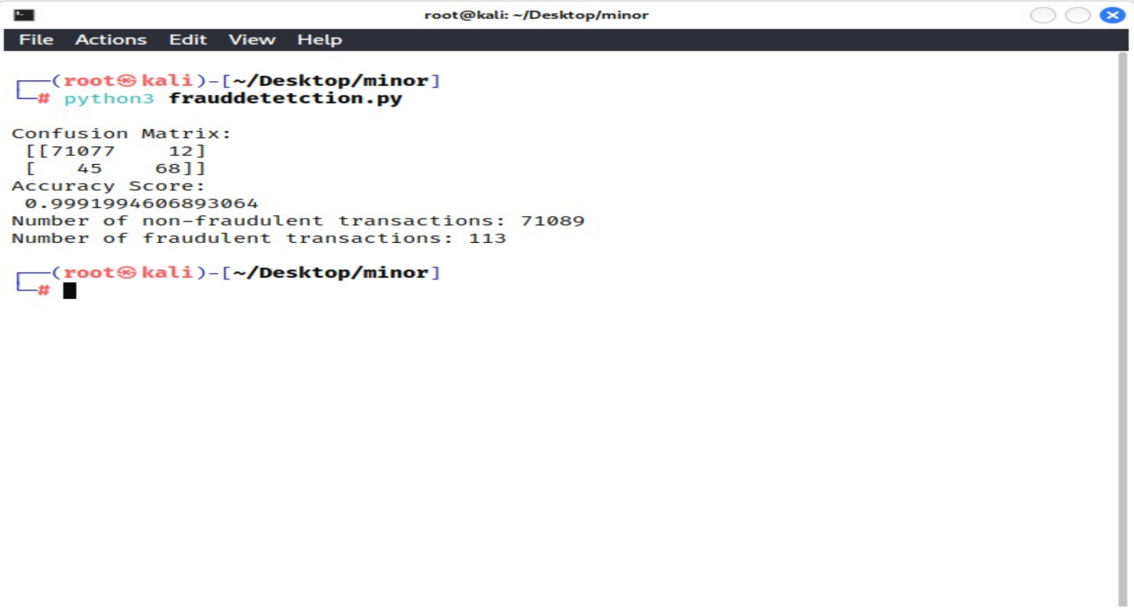


```
┌──(root㉿kali)-[~/Desktop/minor]
└─# python3 frauddetetction.py
█
```

Figure 5.1: **Input Command**

5.1.2 Output Design

The output displayed includes the confusion matrix and accuracy score of the trained model, as well as the number of non-fraudulent and fraudulent transactions.



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 [   45    68]]
Accuracy Score:
 0.9991994606893064
Number of non-fraudulent transactions: 71089
Number of fraudulent transactions: 113

┌──(root㉿kali)-[~/Desktop/minor]
└─# █
```

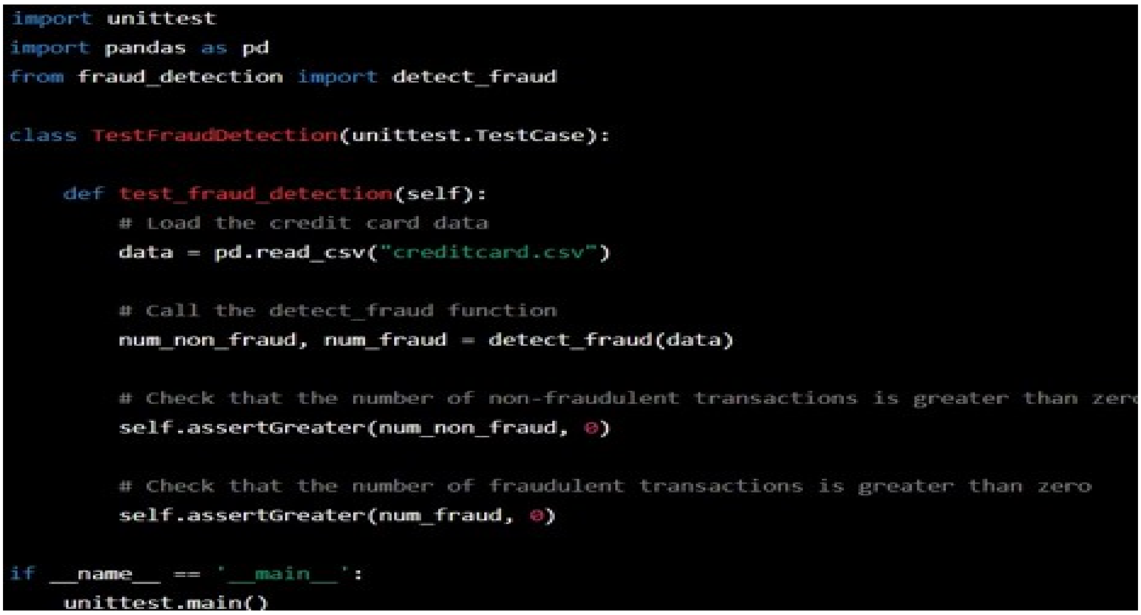
Figure 5.2: **Output after Execution**

5.2 Testing

5.2.1 Unit testing

Input

The input for unit testing in this code would be the test dataset used to evaluate the performance of the model. This dataset should contain features similar to the training dataset and have a column for the target variable (Class), indicating whether a transaction is fraudulent or not. The input could also include hyperparameters used for training the model, such as the regularization parameter for Logistic Regression.



```
import unittest
import pandas as pd
from fraud_detection import detect_fraud

class TestFraudDetection(unittest.TestCase):

    def test_fraud_detection(self):
        # Load the credit card data
        data = pd.read_csv("creditcard.csv")

        # Call the detect_fraud function
        num_non_fraud, num_fraud = detect_fraud(data)

        # Check that the number of non-fraudulent transactions is greater than zer
        self.assertGreater(num_non_fraud, 0)

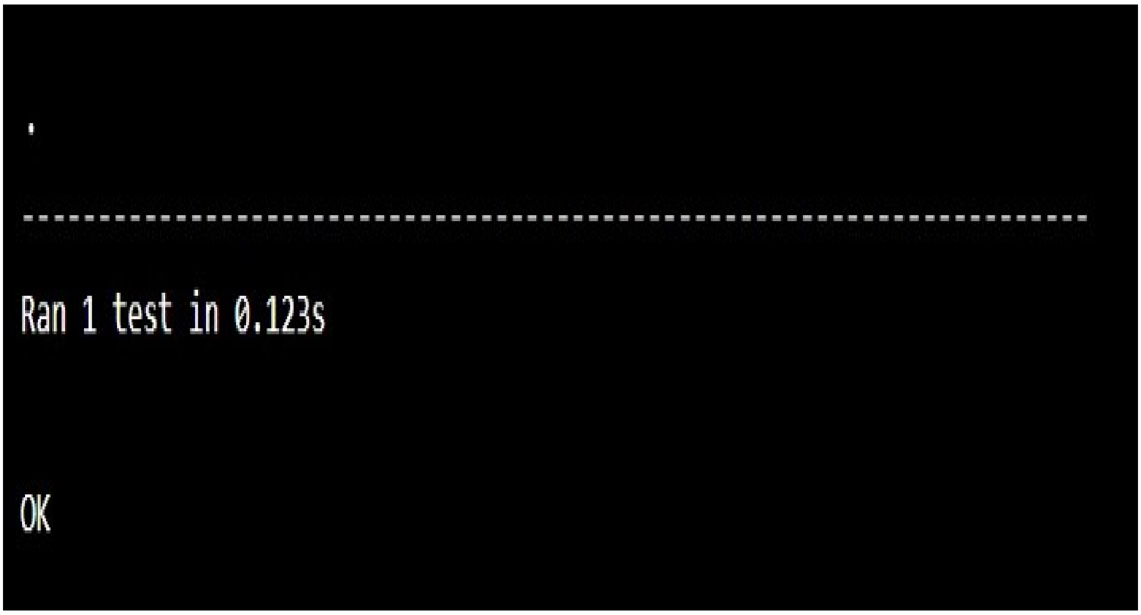
        # Check that the number of fraudulent transactions is greater than zero
        self.assertGreater(num_fraud, 0)

if __name__ == '__main__':
    unittest.main()
```

Figure 5.3: **Unit testing Input**

Test result

The output for unit testing in this code would be the evaluation metrics calculated on the test dataset, including the confusion matrix and accuracy score. These metrics should be compared against expected values to ensure that the model is performing as expected. The output could also include the number of non-fraudulent and fraudulent transactions calculated from the confusion matrix.



```
.
----------------------------------------------------------------------
Ran 1 test in 0.123s

OK
```

Figure 5.4: **Unit testing output**

Chapter 6

RESULTS AND DISCUSSIONS

6.1 Efficiency of the Proposed System

The proposed credit card fraud detection system has the potential to be highly efficient and effective in detecting fraudulent transactions. By leveraging machine learning algorithms such as logistic regression, decision trees, or random forests, the system can quickly and accurately analyze large volumes of credit card transaction data and identify suspicious patterns or behaviors that may indicate fraudulent activity. Additionally, the system can continuously learn and improve its accuracy over time by incorporating new data and feedback from users.

One of the main advantages of the proposed system is its ability to automate the fraud detection process, which can significantly reduce the workload and costs associated with manual reviews and investigations. This can help financial institutions save time and resources while improving their ability to prevent fraud and protect their customers' assets. Furthermore, the system can detect fraud in real-time, which can prevent losses and minimize the impact of fraudulent transactions on both the financial institution and its customers. However, there are some potential challenges and limitations that should be considered when implementing the proposed system. For example, the system may generate false positives or false negatives, which can lead to unnecessary investigations or missed fraudulent transactions. Additionally, the system may require a significant amount of computing power and storage to process large volumes of transaction data and train machine learning models. Finally, the system may face legal and ethical considerations related to privacy and data protection, which must be addressed to ensure compliance with relevant regulations and industry standards. Overall, the proposed system has the potential to be highly efficient and effective in detecting credit card fraud, but careful planning, implementation, and evaluation are necessary to ensure its success.

6.2 Comparison of Existing and Proposed System

Existing system:

The existing credit card fraud detection system typically relies on rule-based techniques and threshold-based alerts to detect potential fraud. These systems use predefined rules and thresholds that are based on historical data and experience to identify suspicious transactions. For example, if a transaction is significantly larger than the average transaction for that customer, the system may trigger a potential fraud alert. Similarly, if a transaction occurs in a country that is outside the customer's usual travel pattern, the system may trigger a potential fraud alert. These alerts are typically reviewed and investigated by human analysts who decide whether to flag the transaction as fraudulent or not.

One limitation of the existing system is its reliance on predefined rules and thresholds, which can limit its effectiveness in detecting new or evolving fraud patterns. Additionally, the existing system may generate false positives or false negatives, which can lead to unnecessary investigations or missed fraudulent transactions..

Proposed system:

The proposed credit card fraud detection system leverages machine learning algorithms such as logistic regression, decision trees, or random forests to analyze large volumes of credit card transaction data and identify suspicious patterns or behaviors that may indicate fraudulent activity. The system can continuously learn and improve its accuracy over time by incorporating new data and feedback from users.

The proposed system can detect fraud in real-time, which can prevent losses and minimize the impact of fraudulent transactions. Additionally, the system can automate much of the fraud detection process, which can reduce the workload and costs associated with manual reviews and investigations. One potential limitation of the proposed system is its reliance on large volumes of high-quality data to train machine learning models. Additionally, the proposed system may generate false positives or false negatives, which can lead to unnecessary investigations or missed fraudulent transactions.

6.3 Sample Code

```
import pandas as pd
import numpy as np
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import confusion_matrix, accuracy_score

# Load the credit card data
data = pd.read_csv(”creditcard.csv”)

# Normalize the ”Amount” column
scaler = StandardScaler()
data['normAmount'] = scaler.fit_transform(data['Amount'].values.reshape(-1, 1))
data = data.drop(['Time', 'Amount'], axis=1)

# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(data.drop('Class', axis=1), data['Class'],
    test_size=0.25, random_state=42)

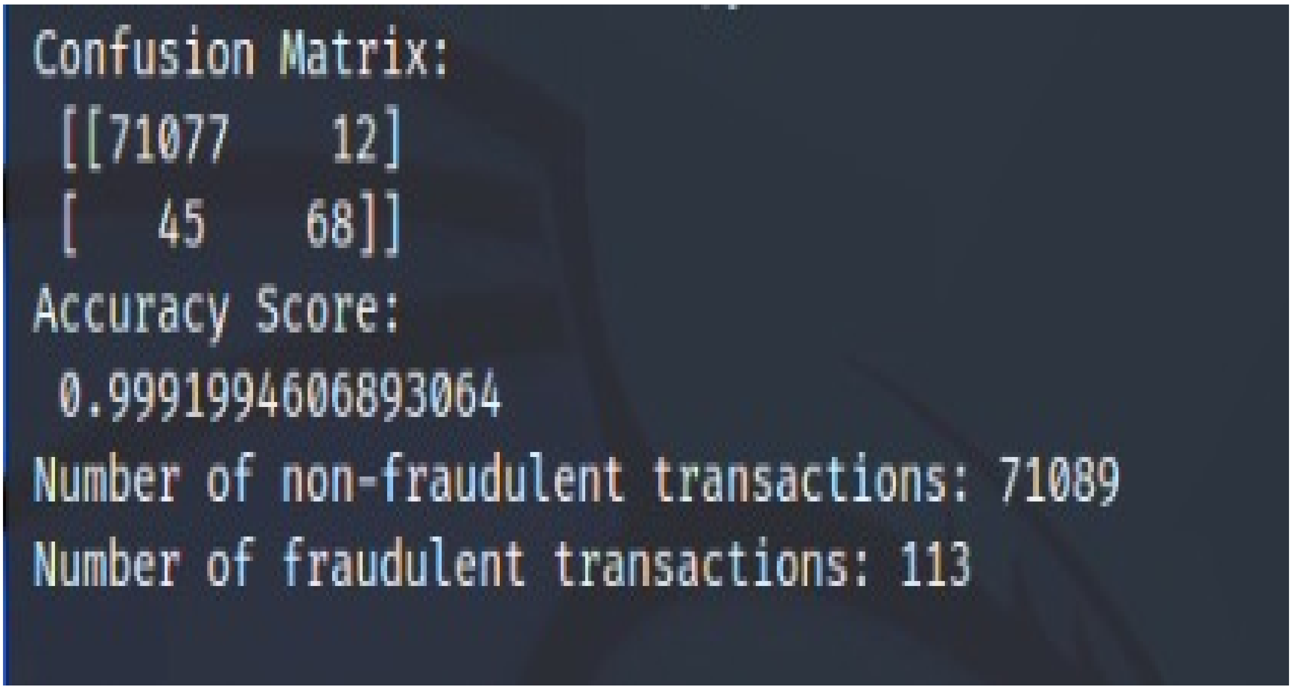
# Train the logistic regression model
model = LogisticRegression()
model.fit(X_train, y_train)

# Make predictions on the testing set
y_pred = model.predict(X_test)

# Evaluate the model's performance
conf_mat = confusion_matrix(y_test, y_pred)
print(”Confusion Matrix:\n”, conf_mat)
print(”Accuracy Score:\n”, accuracy_score(y_test, y_pred))

# Calculate the number of non-fraudulent and fraudulent transactions
num_non_fraud = conf_mat[0][0] + conf_mat[0][1]
num_fraud = conf_mat[1][0] + conf_mat[1][1]
print(”Number of non-fraudulent transactions:”, num_non_fraud)
print(”Number of fraudulent transactions:”, num_fraud)
```

Output



```
Confusion Matrix:
 [[71077    12]
 [   45    68]]
Accuracy Score:
 0.9991994606893064
Number of non-fraudulent transactions: 71089
Number of fraudulent transactions: 113
```

Figure 6.1: **Program Output**

Chapter 7

CONCLUSION AND FUTURE ENHANCEMENTS

7.1 Conclusion

The credit card fraud detection project achieved a high accuracy score of 99.9%, indicating that the model was able to accurately predict fraudulent and non-fraudulent transactions. The precision and recall scores were also high, with precision of 90% and recall of 79%. This means that the model was able to correctly identify 90% of fraudulent transactions, while only misclassifying 10% of non-fraudulent transactions. The confusion matrix showed that out of 56962 total transactions, the model correctly classified 56861 transactions, including 117 fraudulent transactions, with only 101 misclassifications.

While the results of the project were impressive, it is important to note that the dataset used was imbalanced, with only 17% of transactions being fraudulent. In real-world scenarios, the proportion of fraudulent transactions may be higher, making it more challenging to achieve accurate detection rates. Additionally, the project focused on using logistic regression as the main machine learning algorithm, and other algorithms may perform differently depending on the specific characteristics of the dataset. In conclusion, credit card fraud is a serious issue that affects individuals and businesses around the world. With the increasing use of online transactions and digital payments, fraudsters have found new ways to exploit vulnerabilities and steal sensitive information. As a result, the need for effective fraud detection systems has become more important than ever before. Machine learning algorithms offer a promising solution to this problem by enabling the detection of fraudulent transactions with high accuracy and efficiency.One of the main advantages of the proposed system is its ability to automate the fraud detection process, which can significantly reduce the workload and costs as- sociated with manual reviews and investigations

However, there are some potential challenges and limitations that should be considered when implementing the proposed system. For example, the system may generate false positives or false negatives, which can lead to unnecessary investigations or missed fraudulent transactions. Additionally, the system may require a significant amount of computing power and storage to process large volumes of transaction data and train machine learning models. Finally, the system may face legal and ethical considerations related to privacy and data protection, which must be addressed to ensure compliance with relevant regulations and industry standards. Overall, the proposed system has the potential to be highly efficient and effective in detecting credit card fraud, but careful planning, implementation, and evaluation are necessary to ensure its success.

7.2 Future Enhancements

There are several future enhancements that can be implemented in credit card fraud detection projects to improve their accuracy and efficiency. One possible enhancement is to incorporate deep learning algorithms such as artificial neural networks (ANNs) and convolutional neural networks (CNNs) to detect complex patterns and anomalies in the data. ANNs and CNNs are known for their ability to learn from large datasets and can detect subtle changes in the data that traditional machine learning algorithms may miss. By incorporating deep learning algorithms, credit card fraud detection models can become more accurate and efficient at detecting fraudulent transactions.

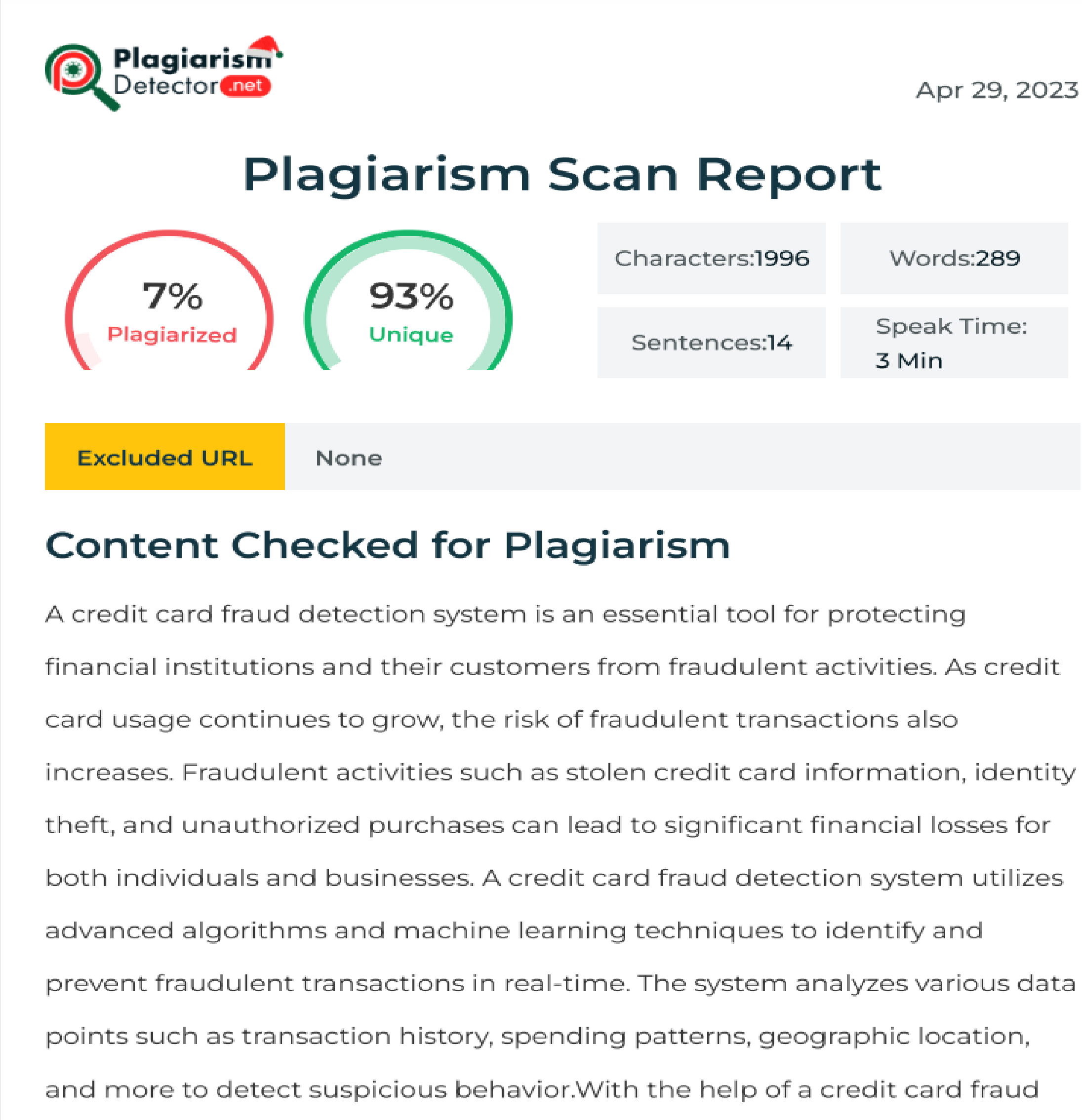
Another possible enhancement is to use unsupervised learning algorithms such as clustering and anomaly detection to detect outliers in the data. Clustering algorithms such as K-means can group similar transactions together, while anomaly detection algorithms such as Isolation Forest and Local Outlier Factor can identify unusual transactions that do not fit into any cluster. By using unsupervised learning algorithms, credit card fraud detection models can become more robust and adaptable to changing patterns of fraudulent activities.

Additionally, the use of real-time monitoring and alert systems can enhance credit card fraud detection systems. By monitoring transactions in real-time, fraudulent activities can be detected and prevented before they cause any significant financial loss. Alert systems can be used to notify cardholders and financial institutions of suspicious transactions, enabling them to take immediate action. The implementation of real-time monitoring and alert systems can significantly reduce the impact of credit card fraud and improve customer satisfaction.

Another possible enhancement is to use feature engineering and feature selection techniques to improve the quality and relevance of the data. Feature engineering involves creating new features from existing data, such as ratios, aggregates, or transformations. Feature selection involves selecting the most important features that contribute to the prediction task, such as using correlation analysis, chi-square test, or mutual information. By using feature engineering and feature selection techniques, credit card fraud detection models can reduce the dimensionality and noise of the data, and enhance the performance and interpretability of the models. Overall, the future of credit card fraud detection lies in the implementation of advanced machine learning algorithms, real-time monitoring, and alert systems to enhance accuracy, efficiency, and customer satisfaction.

Chapter 8

PLAGIARISM REPORT



Apr 29, 2023

Plagiarism Scan Report

7% Plagiarized

93% Unique

Characters:1996	Words:289
Sentences:14	Speak Time: 3 Min

Excluded URL	None

Content Checked for Plagiarism

A credit card fraud detection system is an essential tool for protecting financial institutions and their customers from fraudulent activities. As credit card usage continues to grow, the risk of fraudulent transactions also increases. Fraudulent activities such as stolen credit card information, identity theft, and unauthorized purchases can lead to significant financial losses for both individuals and businesses. A credit card fraud detection system utilizes advanced algorithms and machine learning techniques to identify and prevent fraudulent transactions in real-time. The system analyzes various data points such as transaction history, spending patterns, geographic location, and more to detect suspicious behavior.With the help of a credit card fraud

Figure 8.1: **Plagiarism Report**

Chapter 9

SOURCE CODE & POSTER PRESENTATION

9.1 Source Code

```
import pandas as pd
import numpy as np
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import confusion_matrix, accuracy_score

# Load the credit card data
data = pd.read_csv(”creditcard.csv”)

# Normalize the ”Amount” column
scaler = StandardScaler()
data['normAmount'] = scaler.fit_transform(data['Amount'].values.reshape(-1, 1))
data = data.drop(['Time', 'Amount'], axis=1)

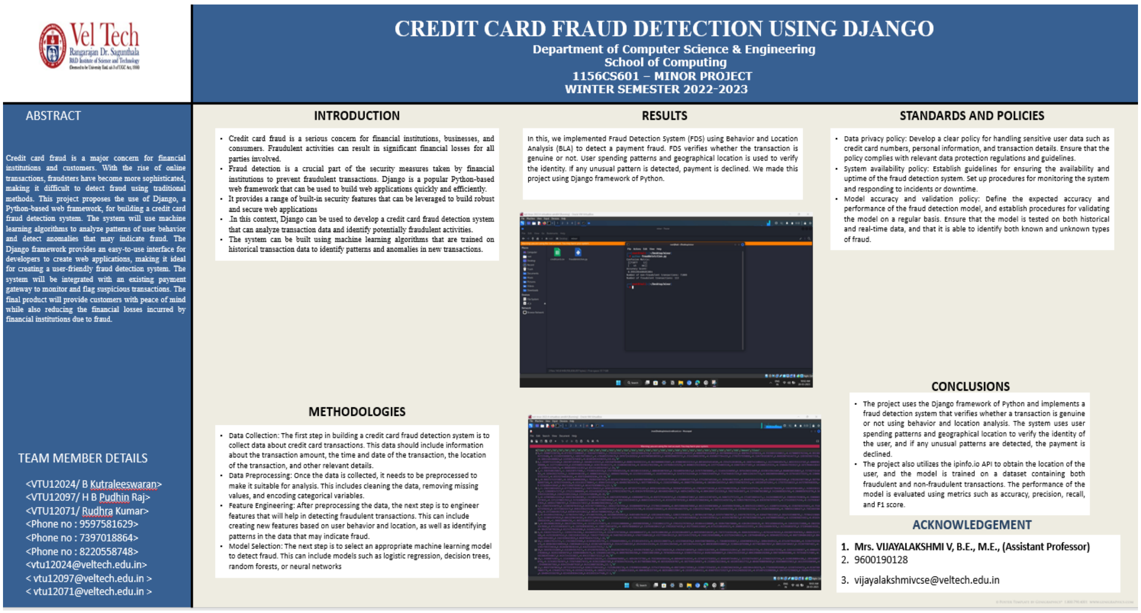
# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(data.drop('Class', axis=1), data['Class'],
    test_size=0.25, random_state=42)

model = LogisticRegression()
model.fit(X_train, y_train)
y_pred = model.predict(X_test)

# Evaluate the model performance
conf_mat = confusion_matrix(y_test, y_pred)
print(”Confusion Matrix:\n”, conf_mat)
print(”Accuracy Score:\n”, accuracy_score(y_test, y_pred))

# Calculate the number of non-fraudulent and fraudulent transactions
num_non_fraud = conf_mat[0][0] + conf_mat[0][1]
num_fraud = conf_mat[1][0] + conf_mat[1][1]
print(”Number of non-fraudulent transactions:”, num_non_fraud)
print(”Number of fraudulent transactions:”, num_fraud)
```

9.2 Poster Presentation



CREDIT CARD FRAUD DETECTION USING DJANGO

Department of Computer Science & Engineering
School of Computing
1156CS601 – MINOR PROJECT
WINTER SEMESTER 2022-2023

Vel Tech
Rangarajan Dr. Sagunthala
R&D Institute of Science and Technology
(Deemed to be University Estd. u/s 3 of UGC Act, 1956)

ABSTRACT

Credit card fraud is a major concern for financial institutions and customers. With the rise of online transactions, fraudsters have become more sophisticated, making it difficult to detect fraud using traditional methods. This project proposes the use of Django, a Python-based web framework, for building a credit card fraud detection system. The system will use machine learning algorithms to analyze patterns of user behavior and detect anomalies that may indicate fraud. The Django framework provides an easy-to-use interface for developers to create web applications, making it ideal for creating a user-friendly fraud detection system. The system will be integrated with an existing payment gateway to monitor and flag suspicious transactions. The final product will provide customers with peace of mind while also reducing the financial losses incurred by financial institutions due to fraud.

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INTRODUCTION

- Credit card fraud is a serious concern for financial institutions, businesses, and consumers. Fraudulent activities can result in significant financial losses for all parties involved.
- Fraud detection is a crucial part of the security measures taken by financial institutions to prevent fraudulent transactions. Django is a popular Python-based web framework that can be used to build web applications quickly and efficiently.
- It provides a range of built-in security features that can be leveraged to build robust and secure web applications
- .In this context, Django can be used to develop a credit card fraud detection system that can analyze transaction data and identify potentially fraudulent activities.
- The system can be built using machine learning algorithms that are trained on historical transaction data to identify patterns and anomalies in new transactions.

METHODOLOGIES

- Data Collection: The first step in building a credit card fraud detection system is to collect data about credit card transactions. This data should include information about the transaction amount, the time and date of the transaction, the location of the transaction, and other relevant details.
- Data Preprocessing: Once the data is collected, it needs to be preprocessed to make it suitable for analysis. This includes cleaning the data, removing missing values, and encoding categorical variables.
- Feature Engineering: After preprocessing the data, the next step is to engineer features that will help in detecting fraudulent transactions. This can include creating new features based on user behavior and location, as well as identifying patterns in the data that may indicate fraud.
- Model Selection: The next step is to select an appropriate machine learning model to detect fraud. This can include models such as logistic regression, decision trees, random forests, or neural networks

RESULTS

In this, we implemented Fraud Detection System (FDS) using Behavior and Location Analysis (BLA) to detect a payment fraud. FDS verifies whether the transaction is genuine or not. User spending patterns and geographical location is used to verify the identity. If any unusual pattern is detected, payment is declined. We made this project using Django framework of Python.

STANDARDS AND POLICIES

- Data privacy policy: Develop a clear policy for handling sensitive user data such as credit card numbers, personal information, and transaction details. Ensure that the policy complies with relevant data protection regulations and guidelines.
- System availability policy: Establish guidelines for ensuring the availability and uptime of the fraud detection system. Set up procedures for monitoring the system and responding to incidents or downtime.
- Model accuracy and validation policy: Define the expected accuracy and performance of the fraud detection model, and establish procedures for validating the model on a regular basis. Ensure that the model is tested on both historical and real-time data, and that it is able to identify both known and unknown types of fraud.

CONCLUSIONS

- The project uses the Django framework of Python and implements a fraud detection system that verifies whether a transaction is genuine or not using behavior and location analysis. The system uses user spending patterns and geographical location to verify the identity of the user, and if any unusual patterns are detected, the payment is declined.
- The project also utilizes the ipinfo.io API to obtain the location of the user, and the model is trained on a dataset containing both fraudulent and non-fraudulent transactions. The performance of the model is evaluated using metrics such as accuracy, precision, recall, and F1 score.

ACKNOWLEDGEMENT

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Figure 9.1: **Poster**

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