Intelligent Fraud Detection System Using Machine Learning

A

Project Report
Intelligent Fraud Detection

Bachelor of Technology
In
Information Technology

Submitted to
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2024-2025

Declaration

I hereby declared that the work, which is being presented in the project entitled **Fraud Detection** partial fulfilment of the requirement for the award of the degree of **Bachelor of Technology**, submitted in the department of **Information Technology** at **Acropolis Institute of Technology & Research, Indore** is anauthentic record of my own work carried under the supervision of **Prof. Ankita Agrawal.** I have not submitted the matter embodied in this report for award of any other degree.

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Acknowledgement

With boundless love and appreciation, we would like to extend our/my heartfelt gratitude and appreciation to the people who helped us to bring this work to reality. We would like to have some space of acknowledgement for them.

Foremost, our would like to express our/ my sincere gratitude to our supervisor, **Prof. Ankita Agrawal** whose expertise, consistent guidance, ample time spent and consistent advice that helped us/me to bring this study into success.

To the project in-charge **Prof. Deepak Singh Chouhan** and project coordinator **Prof. Shahida Khan** For their constructive comments, suggestions, and critiquing even in hardship.

To the honorable **Prof. (Dr.) Prashant Lakkadwala**, Head, Department of Information Technology for his favorable responses regarding the study and providing necessary facilities.

To the honorable **Dr. S.C. Sharma**, Director, AITR, Indore for his unending support, advice and effort to make it possible.

Finally, we would like to pay our thanks to faculty members and staff of the Department of Information Technology for their timely help and support.

We also like to pay thanks to our **parents** for their eternal love, support and prayers without them it is not possible.

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Abstract

Credit card fraud is a widespread issue in the financial sector, causing substantial financial losses to banks, financialinstitutions, and cardholders alike. As digital transactions grow, so does the threat of fraud, making it essential to develop effective detection and prevention measures. This research aims to create a sophisticated fraud detection system that leverages machine learning algorithms to identify and prevent fraudulent transactions in real-time.

The proposed system continuously monitors transactions, evaluating each one based on historical data and behavioral patterns of the cardholder. Machine learning algorithms such as decision trees, support vector machines, and neural networks play a critical role by learning from vast datasets, enabling them to detect subtle irregularities that might indicate fraud. These algorithms analyze transaction attributes like location, time, amount, and frequency, cross-referencing them with prior behaviors to detect unusual patterns. For instance, a transaction occurring in a foreign location, far from the cardholder's typical purchasing area, might trigger a warning.

A significant advantage of machine learning in fraud detection is its adaptability. With every transaction, the system learns and improves, making its fraud detection capabilities more refined over time. This continuous learning process enhances the system's accuracy, reducing false positives and ensuring that genuine transactions are processed smoothly. Additionally, real-time processing is crucial, as it allows for immediate action, such as flagging,blocking, or alerting the cardholder about suspicious transactions, thereby minimizing potential losses.

The effectiveness of the system is evaluated by metrics like precision, recall, and the F1 score, which measure the system's accuracy in distinguishing between fraudulent and legitimate transactions. By combining these metrics with real-time data processing, the system not only identifies fraudulent activities quickly but also ensures a positive experience for legitimate users. Ultimately, this research demonstrates that a well-trained machine learning-based fraud detection system is an invaluable asset for financial institutions, capable of reducing losses from fraud and safeguarding customers' assets effectively.

Keywords—Machine learning, Unified Modeling Language,

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List of Abbreviations

ML - Machine Learning

IDE - Integrated Development Environment

UML - Unified Modeling Language

ROI - Return on Investment

UI - User Interface

CSV - Comma-Separated Values

SSL - Secure Sockets Layer

BD - Block Diagram

AUC-ROC - Area Under the Receiver Operating Characteristic

Chapter 1: Introduction

In today's interconnected world, financial transactions play a pivotal role in our daily lives. With the rapid growth of digital payment systems and online ecommerce, the volume of transactions has surged significantly. While this technological advancement has brought convenience and efficiency, it has also opened the door to various forms of fraud. Fraudulent activities, whether in the form of credit card fraud, insurance fraud, or identity theft, pose a significant threat to individuals, businesses, and financial institutions. Detecting and preventing these fraudulent activities has thus become a critical concern.
Machine learning, a subset of artificial intelligence, has emerged as a powerful tool to combat fraudulent activities. By utilizing advanced algorithms, machine learning models can analyze vast amounts of data and extract patterns that may indicate fraudulent behavior. This capability has revolutionized the way organizations approach fraud detection, allowing for more proactive and accurate identification of fraudulent transactions.
This project aims to explore the application of machine learning algorithms in fraud detection. The primary objective is to design, develop, and evaluate a robust fraud detection system that can effectively identify potentially fraudulent transactions while minimizing false positives. To achieve this, we will leverage historical transaction data and apply various machine learning techniques, such as supervised learning, unsupervised learning, and deep learning.

1.1 Overview

Fraud detection is a critical challenge in today's digital world, where financial transactions are conducted at an unprecedented scale. The rise of online commerce and digital payment systems has created opportunities for various forms of fraudulent activities, such as credit card fraud, the insurance fraud, and identity theft. To combat these threats effectively, organizations and financial institutions have turned to machine learning algorithms as a powerful tool to identify and prevent fraudulent transaction
Ultimately, this project highlights the significance of machine learning in the field of fraud detection, emphasizing its potential to reduce financial losses and protect the integrity of digital transactions. Fraud detection is an evolving field, and this project represents a step toward developing more advanced and effective solutions for addressing fraudulent activities in the modern financial lands

Objectives:

Data Collection: Gather historical transaction data from various sources, including financial institutions, to build a comprehensive dataset for analysis.
Data Preprocessing: Clean, transform, and preprocess the raw transaction data to ensure its quality and suitability for machine learning analysis. Address issues such as missing values and data inconsistencies.
Feature Engineering: Identify and engineer relevant features that can effectively capture the unique characteristics of fraudulent and legitimate transactions. These features should enhance the discrimination power of machine learning models.
Model Selection: Evaluate and select appropriate machine learning algorithms for fraud detection. Consider a variety of algorithms, such as logistic regression, decision trees, random forests, support vector machines, and neural networks.
Model Training and Evaluation: Train selected machine learning models using a portion of the historical data. Fine-tune the models to optimize their performance. Evaluate their effectiveness in identifying potentially fraudulent transactions while minimizing false alarms.

1.2 Scope of the Project

This project is focused on the application of machine learning algorithms.
for the detection of financial fraud within the provided historical transaction dataset. It includes data preprocessing, feature engineering, and the evaluation of multiple machine learning algorithms. The project's scope does not involve real-time deployment, external data sources, or specific geographic or organizational considerations. The recommendations are intended to provide a foundation for enhancing fraud detection capabilities.
This project's scope covers the use of machine learning algorithms for financial fraud detection using historical transaction data. It encompasses data preprocessing, feature engineering, and model evaluation, with a focus on general recommendations. Real-time deployment and external data sources are not within the project's scope. Fraud Types: The project primarily focuses on the detection of financial fraud, such as credit card fraud, insurance fraud, and identity theft. While the principles of fraud detection can be applied to various domains, this project specifically addresses fraudulent activities in the financial sector. Data Sources: The project relies on historical transaction data from financial institutions and related sources. The analysis and models are built

1.3 Report Structure

The project Development of Integrated dashboard for sharing of innovation and startups with success stories is primarily concerned with the real-time and whole project report is categorized into five chapters.

Chapter 1: Introduction- Introduces the background of the problem followed by rationale for the project undertaken. The chapter describes the objectives, scope and applications of the project. Further, the chapter gives the details of team members and their contribution in development of project which is then subsequently ended with report outline.

Chapter 2: Review of Literature- explores the work done in the area of Project undertaken and discusses the limitations of existing system and highlights the issues and challenges of project area. The chapter finally ends up with the requirement identification for present project work based on
findings drawn from reviewed literature and end user interactions.

Chapter 3: Proposed System - starts with the project proposal based on requirement identified, followed by benefits of the project. The chapter also illustrate software engineering paradigm used along with different design representation. The chapter also includes block diagram and details of major modules of the project. Chapter also gives insights of different type of feasibility study carried out for the project undertaken. Later it gives details of the different deployment requirements for the developed project.

Chapter 4: Implementation - includes the details of different Technology/ Techniques/ Tools/ Programming Languages used in developing the Project. The chapter also includes the different user interface designed in project along with their functionality. Further it discuss the experiment results along with testing of the project. The chapter ends with evaluation of project on different parameters like accuracy and efficiency.

Chapter 5: Conclusion - Concludes with objective wise analysis of results and limitation of present work which is then followed by suggestions and recommendations for further improvement.

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Chapter 2

Review of Literature

The literature on fraud detection using machine learning algorithms underscores the transformative impact of this technology in the realm of financial security. Researchers have extensively explored the potential of supervised learning methods, including logistic regression and support vector machines, for their ability to learn from historical data and accurately predict fraudulent transactions. Equally significant is the application of unsupervised learning, particularly clustering and anomaly detection, which can identify novel fraud patterns by comparing transaction behavior stop historical norms.
Furthermore, deep learning techniques, such as neural networks, have gained prominence for their capacity to automatically extract complex features from transaction data, enhancing fraud detection accuracy.
Feature engineering, a critical aspect of model development, has been highlighted as a means to improve discrimination between legitimate and fraudulent transactions. Real-time fraud detection, leveraging streaming data, is also a focus, aiming to promptly identify and respond to suspicious activities.
Challenges surrounding data quality, model interpretability, and class imbalance persist but have spurred research into solutions such as oversampling techniques and interpretable model architectures.
Collectively, the literature reveals the significant potential of machine learning in revolutionizing fraud detection, with ongoing efforts to refine techniques and develop advanced systems to protect financial transactions and the fraudulent activities.

2.1 Preliminary Investigation

2.1.1 Current System

The current system for fraud detection in the financial sector predominantly relies on rule-based approaches and traditional statistical methods. These systems use predefined rules and thresholds to the flag potentially fraudulent transaction the transactions based on predetermined criteria. While these systems can be effective to some extent, they have limitations in adapting to evolving fraud patterns and may generate a high number of false positives.

Additionally, many financial institutions employ manual review processes, where human experts manually inspect transactions that are flagged as potentially fraudulent. This manual review is time-consuming, resource- intensive, and prone to human error. It may also result in delays in identifying and responding to fraudulent activities.

Furthermore, legacy fraud detection systems often struggle to handle the massive volume of transactions in real-time, making it challenging to detect fraud promptly. As a result, fraudsters exploit these gaps in the system to carry out their activities.

In summary, the current system for fraud detection primarily relies on rule-based methods, manual reviews, and legacy systems, which can be effective to some extent but have limitations in terms of adaptability, efficiency, and scalability. Machine learning algorithms offer a promising alternative to enhance the capabilities of fraud detection systems by automating the process and providing the potential to adapt to emerging fraud patterns. Stakeholders in the innovation and startup ecosystem.

2.1.2

1. Established Framework: The current rule-based system provides a well- established framework for identifying and flagging potentially fraudulent transactions. It offers a baseline level of protection and is familiar to financial institutions and their staff.
2. Customization: Financial organizations have the flexibility to customize the rules and criteria used in the current system to match their specific needs and preferences. This customization allows for a

degree of adaptability.

3. Risk Mitigation: By implementing predefined rules and thresholds, the current system helps mitigate certain known risks associated with fraud, offering a level of security and reassurance.
4. Compliance: The current system often aids in regulatory compliance, as it allows financial institutions to demonstrate their commitment to fraud prevention by having a structured approach in place.
5. Low Initial Cost: Implementing a rule-based system can be cost- effective in the short term, especially for smaller organizations with limited resources.

6. Human Expertise: The manual review process, although resource- intensive, benefits from human expertise in recognizing complex fraud patterns that automated systems might overlook.
7. Historical Data: The current system generates historical data on flagged transactions, which can be valuable for retrospective analysis and model training when transitioning to more advanced fraud detection methods.

2.2 Limitations of Current System

The limitations of these are as follows:

1. Lack of Adaptability: Rule-based systems have fixed rules and thresholds that are less adaptable to evolving fraud tactics. They may struggle to keep up with emerging fraud patterns, making them less effective in identifying novel fraud schemes.
2. High False Positives: The reliance on predefined rules can lead to a high number of false positives, where legitimate transactions are incorrectly flagged as fraudulent. This can result in customer inconvenience, increased operational costs, and reduced trust in the system.
3. Manual Reviews: Many current systems necessitate manual reviews off lagged transactions by human experts. This process is time- consuming, resource- intensive, and prone to human error. Delays in fraud detection and response can occur, allowing fraudsters to exploit vulnerabilities.
4. Scalability Issues: Legacy fraud detection systems may struggle to handle the growing volume of transactions, particularly in real-time. This can result in delays and inefficiencies in fraud detection, further increasing the risk of successful fraudulent activities.
5. Limited Feature Extraction: Traditional systems often lack the capacity.

2.3 Requirement Identification and Analysis for Project

Data Access and Collection: Secure access to historical transaction data from financial institutions is essential. The data should cover a significant timeframe and include transaction details, user information, and relevant contextual information.

Data Preprocessing Tools: Robust data preprocessing tools and techniques are required to clean and prepare the raw data. This includes handling missing values, data inconsistencies, and outliers.

Feature Engineering: A thorough analysis of the data to identify and engineer relevant features is crucial for improving model performance. Feature engineering tools and techniques need to be established.

Machine Learning Algorithms: Selection and analysis of various machine learning algorithms, including logistic regression, decision trees, random forests, support vector machines, and neural networks. These algorithms should be tailored to fraud detection tasks.

Model Training Environment: A suitable environment for model training, including sufficient computational resources, is necessary to train and fine-tune the selected machine learning models.

Real-time Data Integration: Development of a real-time data integration system that can ingest streaming transaction data for immediate analysis and decision- making.
Model Evaluation Metrics: Define and establish the criteria for evaluating the performance of machine learning models. This includes accuracy, precision, recall, F1 score, and ROC curves.

Feedback Loop: Implement a feedback loop mechanism that allows the models to learn and adapt from newly identified fraud patterns, ensuring continuous improvement.
Interpretability Tools: Tools and techniques for interpreting machine learning models to ensure transparency and compliance with regulatory requirements.

2.3.1 Conclusion

In the ever-evolving landscape of financial transactions, the need for effective fraud detection systems is paramount. Traditional rule-based approaches, although providing a foundational level of security, exhibit limitations in adaptability and efficiency. This project's exploration into fraud detection using machine learning algorithms presents a promising opportunity to enhance the accuracy, scalability, and responsiveness of fraud detection systems.

Chapter 3

Proposed System

3.1 The Proposal

The proposal centers on the development of a robust fraud detection system utilizing machine learning algorithms. In recognition of the evolving nature of financial fraud and the limitations of traditional rule-based systems, this project aims to harness the potential of advanced technology to enhance the accuracy and efficiency of fraud detection.
The primary objective is to create a system that can proactively identify fraudulent transactions while minimizing false positives.

3.2 Benefits of the Proposed System

1. Enhanced Accuracy: The proposed system leverages machine learning algorithms, enabling it to continuously learn from historical data and adapt to emerging fraud patterns. This results in significantly improved accuracy in identifying fraudulent transactions while minimizing false positives.
2. Real-time Detection: The integration of real-time data analysis allows the system to promptly identify and respond to potentially fraudulent activities, reducing the window of opportunity for fraudsters and minimizing financial losses.
3. Adaptability: Machine learning models can adapt to changing fraud tactics and patterns, making the system versatile and resilient to evolving threats without the need for frequent rule updates.
4. Reduced Manual Intervention: By automating the fraud detection process and minimizing false positives, the proposed system reduces the need for manual reviews, resulting in cost savings and increased operational efficiency.
5. Comprehensive Feature Extraction: Machine learning models excel in extracting intricate and complex features from transaction data, enabling the system to recognize subtle fraud patterns that rule- based systems might overlook.
6. Continuous Improvement: The system's feedback loop facilitates continuous learning, enabling it to improve its performance over time as it identifies new fraud patterns and refines its detection algorithms.
7. Efficient Scalability: With the ability to handle a large volume of transactions in real-time, the proposed system is well-equipped to meet the scalability requirements of organizations experiencing growth.
8. Regulatory Compliance: The proposed system is designed with a focus on compliance, ensuring that it adheres to relevant regulatory requirements, thus reducing the risk of non-compliance.

3.3 Block Diagram

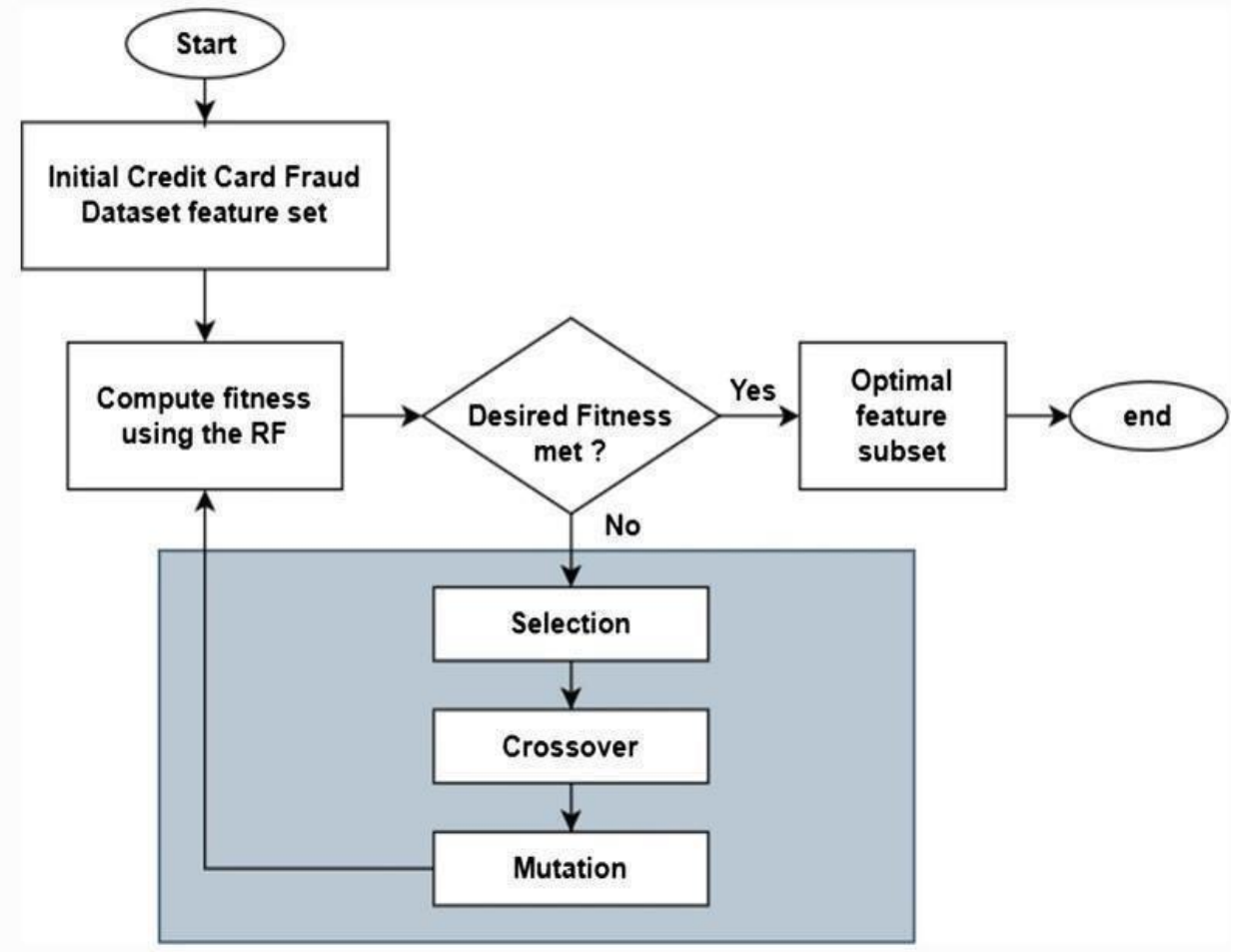


Figure 3-1 : Block Diagram Description: Logistic Regression model.

3.4 Feasibility Study

1. The feasibility study for the proposed project to develop a fraud detection system using machine learning algorithms involves a thorough examination of various critical aspects to determine the project's viability.
2. Technical feasibility entails assessing the availability of required technology and data, ensuring the team's technical expertise, and confirming that the system can handle real-time, large-scale data.
3. Economic feasibility involves a cost-benefit analysis, ROI estimation, and budget allocation assessment to ensure that the project's financial gains justify the investment.
4. Operational feasibility considers user acceptance, training, and operational efficiency to ensure the system can be effectively adopted and integrated into existing operational processes.
5. Legal and regulatory feasibility examines compliance with regulations, data privacy, and data ownership considerations to guarantee legal adherence.
6. Schedule and timeline feasibility establishes a realistic project timeline and assesses resource availability to ensure the project can be execute das planned.
7. The feasibility study guides decision-makers by identifying potential risks and challenges and offering mitigations to make informed decisions regarding the project's continuation. Provides a basis for developing a detailed project plan.

3.4.1 Technical

The technical feasibility of implementing a fraud detection system using machine learning algorithms is a critical aspect of the proposed project. It involves a comprehensive assessment of the project's technological requirements and capabilities.

First and for most, This includes an evaluation of whether the necessary hardware, software, and tools for developing and implementing machine learning models are accessible and can be acquired within the defined budget constraints. It is essential to ensure that the project can access the computing resources and infrastructure required for model training and real-time data analysis. Another key consideration is the availability and quality of data from financial institutions. This data serves and the is foundation for machine learning model development and training. Therefore it is imperative to confirm that a sufficient and representative dataset is obtainable and that data quality issues, such as missing values and inconsistencies, can be effectively addressed.

The complexity of machine learning models is also a technical aspect to scrutinize. Machine learning algorithms can vary in complexity, and it is essential to assess whether the project team possesses the technical expertise required to develop, train, and maintain these models effectively. In some cases, external expertise or collaboration may be necessary to handle advanced machine learning algorithms.

3.1.1 Economical

Economic feasibility is a critical dimension of the proposed project for developing a fraud detection system using machine learning algorithms. It involves a comprehensive analysis of the project's financial viability, taking into account costs, benefits, and potential returns on investment (ROI).

The cost-benefit analysis is a fundamental component of economic feasibility. It entails a meticulous examination of the costs associated with the project, including expenses related to data acquisition, hardware and software procurement, personnel, and ongoing maintenance. These costs must be accurately estimated and managed to ensure that the project remains within budget constraints.

In parallel, the expected benefits of the project should be quantified. These benefits may include reduced fraud losses, operational cost savings, and increased security. By comparing the projected benefits to the total cost of the project, stakeholders can determine whether the investment economically justifiable.

3.1.2 Operational

Operational feasibility is a pivotal aspect of the proposed project to develop fraud detection system using machine learning algorithms. It assesses the practicality of implementing and operating the system effectively within the organization staff.

3.5 Design Representation

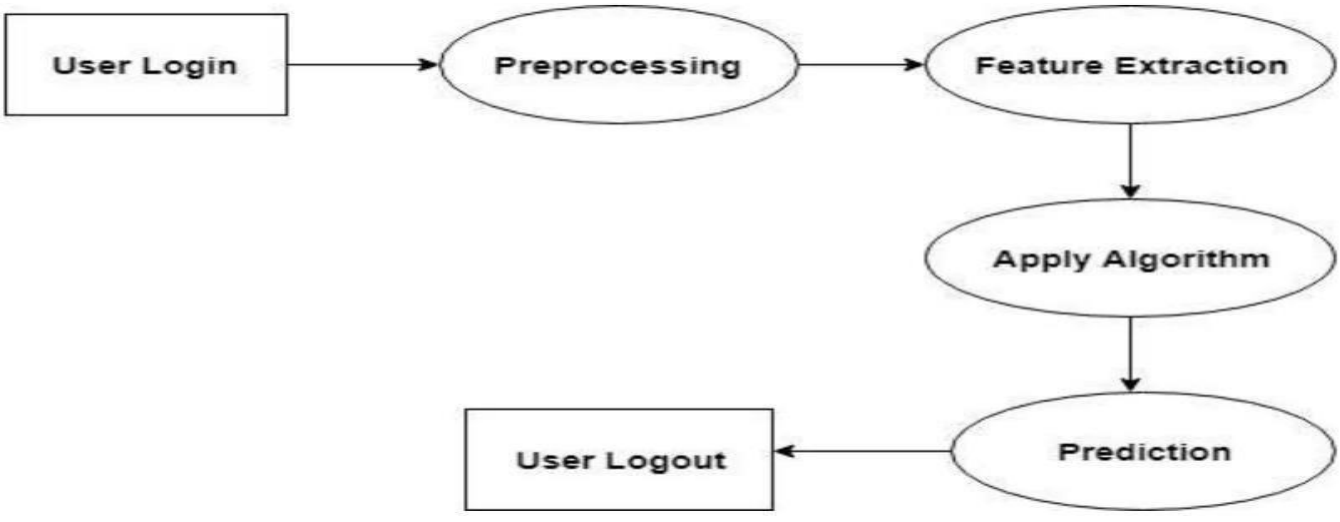


Figure 3-1: Block Diagram

Description: This shows the entire system as a single process, with inputs and outputs. It provides an overview of the entire system and its boundaries

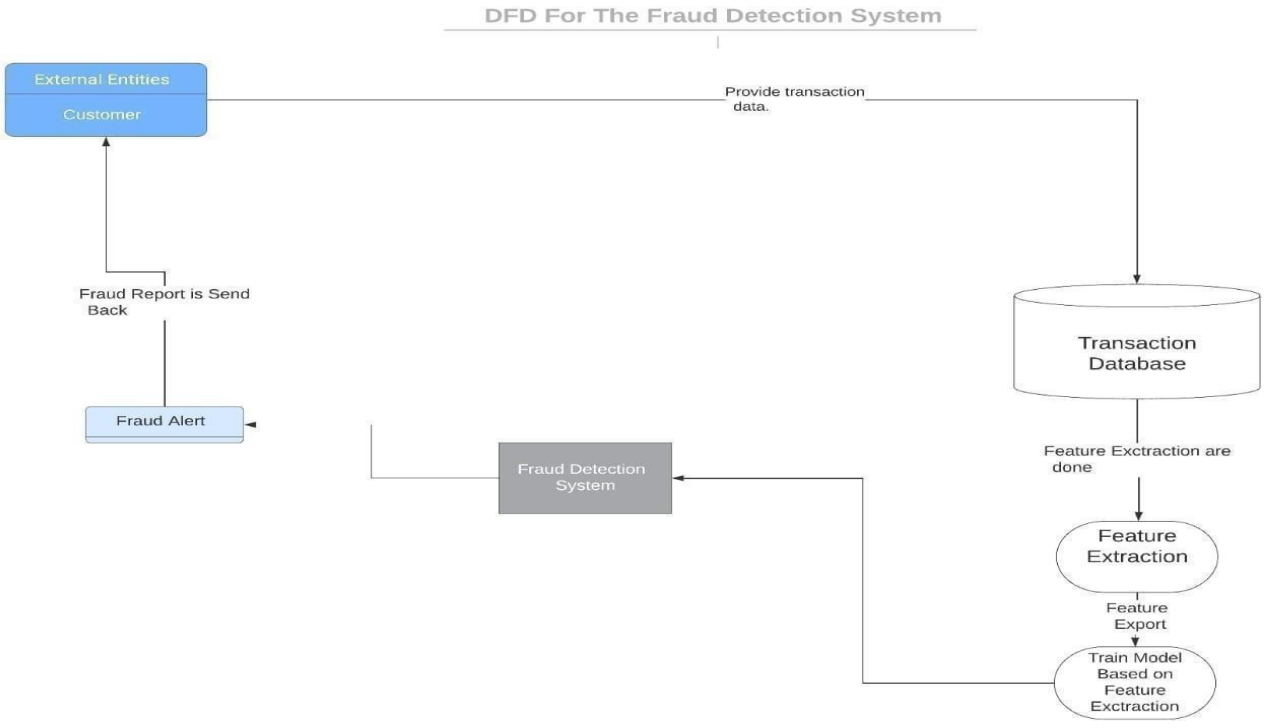
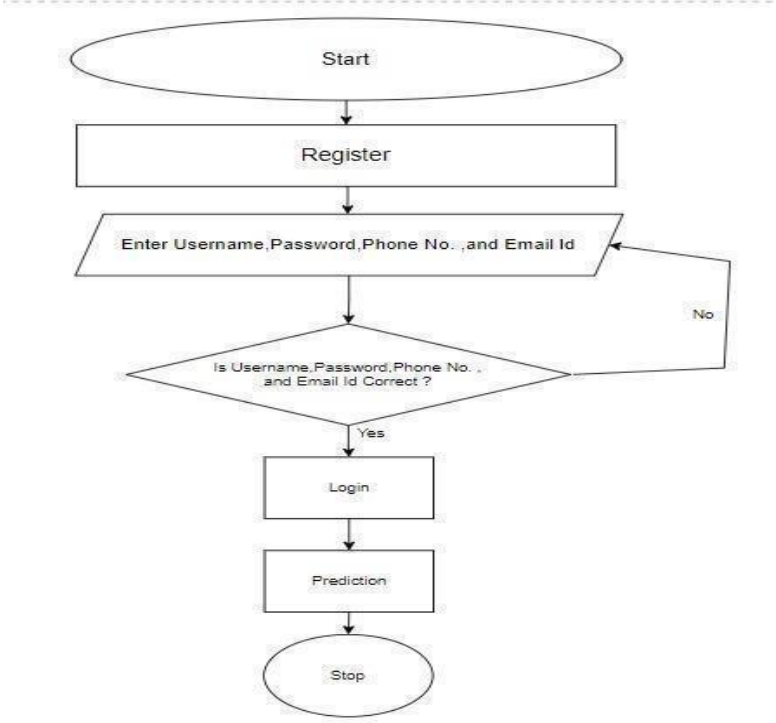


Figure 3-2 : Detailed Block Diagram Description:

This breaks down the system into its major sub- processes, which are represented as bubbles with inputs and outputs. It provides more detail than the level 0



`Figure 3-3 : Flow Chart Diagram

Description: The flowchart represents the process of accessing the dashboard to the fraud detection pageby admin by providing the login details and providing the transaction details to the ML model to predict the fraudulent or legitimate transaction.

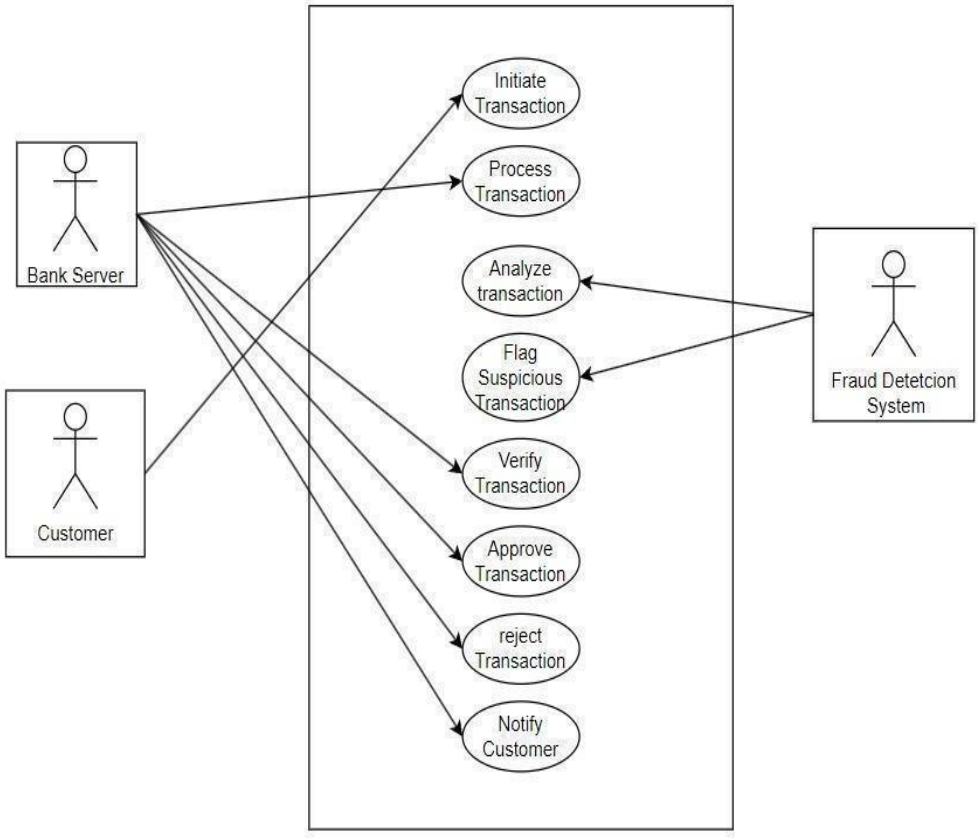


Figure 3-4 : Use Case Diagram

Description: In the context of the Fraudulent detection using machine learning algorithm the bank will have the data of all the transactions and the admin will be able to login to the dashboard to check with the transaction data whether the transaction is Fraud or Legitimate.

3.6 Deployment Requirements

Deployment requirements refer to the hardware and software needed to run the proposed system. In terms of hardware, the system will require a web server to host the platform, a database server to store the data, and sufficient storage space for the data and backups. The server hardware should have a minimum of 8GB RAM, 500GB storage, and a powerful processor to handle the traffic and data processing.

In terms of software, the platform will require a web framework like Django, Flask or Streamlit, a database management system like MySQL or PostgreSQL, and programming languages like Python. The platform will also need additional libraries and tools such as Jupyter Notebook, Anaconda and PyCharm

The deployment environment should be secure and protected against external threats. The platform will need SSL certification, firewalls, and regular security updates to prevent data breaches and unauthorized access. Additionally, the platform should be scalable to handle an increasing number of users and success stories.

Finally, proper documentation and guidelines should be provided for system administrators and developers to ensure smooth deployment and maintenance of the platform.

3.6.1 Hardware

The proposed system will require a server for hosting the application, and client device such as laptops or desktops to access the system.

3.6.2 Software

The proposed system will require software such as PyCharm, Anaconda, Jupyter Notebook, for development and deployment. The system will also require web browsers such as Google Chrome, Mozilla Firefox, or Safari to access the application.

Chapter 4

Implementation

Implementation refers to the process of executing and deploying the proposed system. It involves the actual development and testing of the system, followed by its deployment to the intended users. The implementation phase is crucial in ensuring that the system is fully functional, user-friendly, and meets the specified requirements.

The implementation process typically involves the following steps:

1. Development of the system: This involves the actual coding and programming of the system using the chosen software development tools and programming languages.
2. Testing: The system is tested to ensure that it is working as expected and meets the specified requirements.
3. Deployment: Once the system is fully tested and validated, it is deployed to the intended users or stakeholders.
4. User training: Users are trained on how to use the system effectively and efficiently.
5. Maintenance: After deployment, the system requires regular maintenance and updates to ensure that it remains functional and meets the changing needs of the users.
6. Monitoring: The system is monitored to ensure that it is performing as expected and to identify any issues that may arise.

Overall, the successful implementation of the proposed system requires careful planning, coordination, and effective communication among the development team, stakeholders, and end-users.

4.1 Technique Used

Programming Language:
Python: Python is a popular choice for machine learning and deep learning tasks. It offers a rich ecosystem of libraries and frameworks that are well- suited for image recognition, data preprocessing, and model development.

Data Management and Processing:

Pandas: Pandas is a Python library used for data manipulation and analysis. It can be beneficial for handling datasets and preprocessing.
NumPy: NumPy is another Python library for numerical computing. It's useful for performing operations on multidimensional arrays, which are common in image data.

4.2 Tools Used:

4.2.1 PyCharm

PyCharm is an integrated development environment (IDE) specifically designed for Python programming. While it is a general-purpose IDE for Python, it can be incredibly useful for building machine learning (ML) models. Here's how PyCharm can be helpful in the context of ML:

- Code Editor: PyCharm provides a powerful code editor with features like code completion, code navigation, and smart code analysis. These features help you write clean and error-free Python code, which is essential for ML projects.

- Project Management: PyCharm allows you to organize your ML project effectively. You can create Python virtual environments for isolated package management and set up project-specific configurations.

- Version Control: PyCharm has built-in support for popular version control systems like Git. This is crucial when collaborating on ML projects or managing different versions of your model code.

- Debugging and Profiling: ML projects often involve complex code and

- large datasets. PyCharm's debugging and profiling tools can help you identify and fix issues in your code, as well as optimize its performance.
- Integrated Terminal: PyCharm provides an integrated terminal, which is useful for running scripts, managing data, and executing ML model training and evaluation

4.2.2 Anaconda :

Anaconda (or Anaconda Navigator) is an open-source platform that provides data science toolkits and inbuilt packages for performing various data science tasks. This provides an extra advantage of inter-dependencies of packages, which means it provides you with an environment where each package is compatible with the other.
why Anaconda Navigator could be beneficial for our project:

Anaconda Navigator is a UI Interface, as shown above, which allows you to access different tools like Jupyter Notebook, VS Code, and Spyder directly by clicking on the launching button.
It also allows you to maintain the environment and packages through the Environments tab in the left-side panel. As shown in the above figure, the base is the default environment, with all packages installed in the environment along with versions and descriptions.

4.2.3 Streamlit:

Streamlit is a Python-based library that can be used for creating and deploying machine learning (ML) applications. Stream lit can be used for ML projects because it :

- Creates apps easily: Stream lit allows users to create apps using simple code.
- Supports hot-reloading: Stream lit updates apps live as users edit and save their files.
- Has a sharing platform: Users can deploy their applications using the Streamlit sharing platform.

- Doesn't require front-end web development experience: Users don't need any front-end web development experience to start developing with Streamlit.
- Has an intuitive interface: Users can read in a saved model and interact with it using an intuitive interface.
- Is fast and flexible: Streamlit can turn application development time from days into hours.

4.3 Language Used

4.3.1 Python:

Python is a programming language that is preferred for programming due to its vast features, applicability, and simplicity. The Python programming language best fits machine learning due to its independent platform and its popularity in the programming community.
Libraries and frameworks are vital in the preparation of a suitable programming environment. Python frameworks and libraries offer a reliable environment that reduces software development time significantly. A library basically includes a prewritten code that developers can use to speed up coding when working on complex projects.
Python includes a modular machine learning library known as PyBrain, which provides easy-to-use algorithms for use in machine learning tasks. The best and most reliable coding solutions require a proper

structure and tested environment, which is available in the Python frameworks and libraries.

4.4 Testing

Testing is the process of evaluation of a system to detect differences between given input and expected output and also to assess the feature of the system. Testing assesses the quality of the product. It is a process that is done during the development process.

4.4.1 Strategy Used

Conduct functional testing: Functional testing ensures that the dashboard meets the functional requirements defined in the project plan. This includes testing each feature and functionality of the dashboard to ensure that it works as intended.

Conduct security testing: Security testing ensures that the dashboard is secure and protected against unauthorized access, data breaches, and other security threats. This includes testing the dashboard's authentication and authorization mechanisms, data encryption, and other security features.

Conduct usability testing: Usability testing ensures that the dashboard is user- friendly and easy to navigate. This includes testing the dashboard's user interface, user experience, and accessibility features.

Conduct performance testing: Performance testing measures the responsiveness, scalability, and reliability of the dashboard under different conditions. This includes testing the dashboard's load handling capacity and response times under heavy user traffic.

4.4.2 Test Case and Analysis

1. **Functional Test Case**: Check whether Model is working fine or not. Objective: To verify that Admin get the result of the transaction is it fraud or not

Test Steps:

- Navigate to the "Login" page
- Fill in the required information
- At home page fill transaction details
- Click the "Submit" button
- Verify that the output is displayed as “Legitimate” or “Fraudulent”

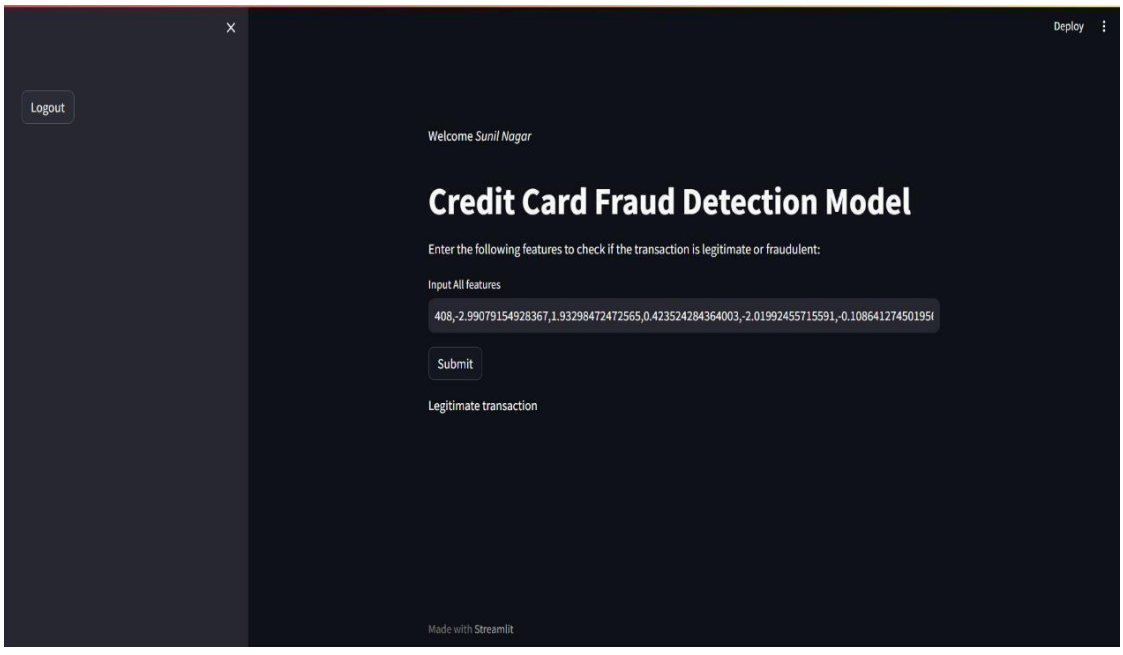


Figure 3-4 : Test Case 1 Output

Chapter 5

Conclusion

5.1 Conclusion

In conclusion, the main objective of this project was to analyze and predict fraudulent transactions with the help of given datasets and python modules and it was met by building the three models and finding the accuracies of them all, the best model in terms of accuracies is Random Forest algorithm as its accuracy is 99.89% with only 3 misclassified instances. I believe that using the model will help in decreasing the amount of credit card fraud and increase the customers satisfaction as it will provide them with better experience in addition to feeling secure.
The non-functional requirements, including security, scalability, and usability, are also considered during the development of the system.

5.2 Limitations of the Work

As with any project, there are certain limitations that must be considered for the Development of Integrated dashboard for sharing of innovation and startups with success stories. Some of these limitations include:

1. Technical limitations: The system may be limited by the technology used to develop it, which can impact its scalability and performance.
2. Data quality: The success of the dashboard relies heavily on the quality of the data being used. If the data is inaccurate or incomplete, it can lead to incorrect insights and analysis.
3. User adoption: The success of the dashboard depends on user adoption and engagement. If users do not find the dashboard useful or user- friendly, they may not use it regularly or provide feedback.
4. Resource constraints: Developing and maintaining a comprehensive dashboard can be time-consuming and expensive. There may be limitations on the resources available to develop and maintain the system.
5. Security concerns: The dashboard may contain sensitive information about the institutions and startups involved. It is important to ensure that the dashboard is secure and protects against unauthorized access.

5.3 Suggestion and Recommendations for Future Work

There are many ways to improve the model, such as using it on different datasets with various sizes, different data types or by changing the data splitting ratio, in addition to viewing it from different algorithm perspective. An example can be merging telecom data to calculate the location of people to have better knowledge of the location of the card owner while his/her credit card is being used, this will ease the detection because if the card owner is in Mumbai and a transaction of his card was made in Chennai it will easily be detected as fraud.

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Guide Interaction Sheet

Date	Discussion	Action Plan
10/08/2023	Discussed about the title of the Project	Fraudulent Detection using Machine Learning Algorithm for credit card
16/09/2023	Discussion on the technology to be used for object detection in real-time	Python will be used.
19/09/2023	Discussion of the creation of synopsis of the project	Gathering of information for synopsis creation
08/10/2023	Suggestions on how to do a literature survey and preliminary investigation on the topic	Many research papers were read , understood and their abstract were to be written.
18/10/2023	Discussion on the implementation of the project	Implementation should be Started.
15/11/2023	Discussion on the objective of the Project.	Develop an ML model to predict The legitimate and fraudulent transaction.
28/11/2023	Discussion on project documentation	Decided to write the content and integrate it in the proper format of the report