International Journal of Engineering Research and Science & Technology

IJERST



ISSN : 2319-5991

www.ijerst.com

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International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com

Vol. 20, Issue 2, 2024

An Innovative Approach to Detecting Credit Card Fraud Through Decision-Making Algorithms for Trees and Random Forests

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ABSTRACT

New methods of doing business emerged in the financial sector with the expansion of technology. One of them is the credit card system. However, many issues with credit card frauds have arisen as a result of several vulnerabilities in this system. This is causing a tremendous loss for the business and for consumers who pay with credit cards. When it comes to privacy concerns, there is a lack of investigation lessons on looking at real credit card numbers. An effort to detect credit card fraud using algorithms that use machine learning approaches is presented in the article. Two algorithms are used for this purpose: one for credit card fraud detection using Decision Tree and the other for random forest fraud detection. It is possible to determine the model's efficiency by sampling from a set of publicly available data. The next step is to look at a real-life credit card data set that a bank has. In addition, the data samples are enhanced with additional noise to further verify the systems' robustness. An important part of the approaches presented in the study is the first one, which builds a tree based on the user's actions and uses it to detect frauds. The second approach involves building an activity-based forest and then trying to identify the suspect using this forest. When it comes to detecting credit card fraud, the research results show that the popular alternative method achieves respectable levels of accuracy.

I.INTRODUCTION

Credit card fraud remains a pervasive issue in the financial industry, posing significant challenges for both financial institutions and cardholders. As fraudulent activities evolve and become increasingly sophisticated, there is a pressing need for robust and adaptive fraud detection systems to mitigate financial losses and protect consumers' assets. In response to this challenge, this project introduces a novel approach for credit card fraud detection using Decision Tree and Random Forest algorithms.

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Traditional fraud detection systems often rely on rule-based methods or simple anomaly detection techniques, which may struggle to keep pace with the dynamic nature of fraudulent activities. Machine learning algorithms offer a promising solution by enabling automated, data-driven fraud detection that can adapt to evolving fraud patterns in real-time. Decision Tree and Random Forest algorithms are particularly well-suited for this task due to their ability to handle high-dimensional data, capture complex relationships between features, and provide interpretable results.

The proposed approach involves training Decision Tree and Random Forest models on a dataset of credit card transactions, where each transaction is labeled as fraudulent or legitimate. By analyzing various transaction attributes such as transaction amount, location, and time, the models learn to distinguish between genuine transactions and fraudulent ones. The Decision Tree algorithm provides a transparent and interpretable model, making it valuable for understanding the decision-making process behind fraud detection. On the other hand, the Random Forest algorithm combines multiple decision trees to improve classification accuracy and robustness against overfitting.

Through experimental evaluation using real-world credit card transaction data, the performance of the Decision Tree and Random Forest algorithms in detecting fraudulent transactions is assessed. Evaluation metrics such as accuracy, precision, recall, and F1-score are used to measure the effectiveness of the proposed approach. The results of the experiments demonstrate the efficacy of the Decision Tree and Random Forest algorithms in accurately identifying fraudulent transactions while minimizing false positives and false negatives.

II.EXISTING SYSTEM

A. A. Akinyelu and O. Adewumi [1] has made a detail study on fraud detection using the method of natural observation of the events happened from the customer side. A. Kundu, S. A. Srivastava Sural and A. Majumdar [2], has made a detailed study on scam detection in credit card business by adopting hidden Markov model. Singh, P. K. Saraswat et al [3], worked on the machine learning oriented techniques for swarm intelligence, since the algorithms discussed in the paper is concerned about the machine learning methods, the scope of the referenced paper may be taken into considerations. Jung, J. J et al

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[4], has worked on the methods of collecting the data from the social media and framing them in terms of big data models and working on the challenges existed the field.

Bharill N et al [5], has made detailed study on Apache Spark which used fuzzy based clustering logic for big data analysis. Y. Sahin et al [6], demonstrated a comprehensive nominal cost model for scam detection in busines s field. The Nilson Report [7], states a detailed report on the various methods of possibility of occurrence of the fraud or scam in the field of credit card business and various methods of identifying them and the adverse effects of the scams on the business environments. J. T. Quah et al [8], described narrated towards the development of an automated model for the detection of the frauds in the business. S. Jha et al [9], implemented a system which supports in the detection of the scams or frauds in the

field of the business by recording the transactions and there by building a model using data mining models. S. Panigrahi et al [10], demonstrated Use of Dempster-Shafer theory and Bayesian inferencing for fraud detection in communication networks. T. Fawcett et al [11], has demonstrated the use of Adaptive fraud detection, Data Mining and Knowledge Discovery. Y. Wang et al [12], has made a detailed study on Distributed Intrusion Detections Based on data fusion method. Yakub K et al [13], has demonstrated Application of GA Feature Selection on Naive Bayes Random Forest and SVM for Credit Card Fraud Detection. Zhang, R et al [14], has gave a wide explanation about Sequential Behavioral Data Processing Using Deep Learning and the Markov Transition Field in Online Fraud Detection. Zhong fang Zhuang et al [15], has demonstrated a system called Attributed Sequence Embedding where the different data sets are constructed using system.

Disadvantages

1) The system doesn't have technique to analyze large number of datasets.

2). There is no technique Random decision forests and Random forests which are the group learning techniques for categorization, prediction and additional jobs that function by building a gigantic volume of decision trees at exercise time and outputting the class.

III.PROPOSED SYSTEM

The proposed system defines the procedure used to hostage the credit card scam. The numerous competent

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approaches like arrangement orientation, device learning, neural networks, artificial intelligence, fuzzy logic are employed to detect and encounter scams in credit card businesses. Credit card fraud has become progressively widespread in modern years. In Current day, the fraud is one of the key causes of excessive business losses, not only for merchants, distinct clients are also affected. So there are some methods to detect such kind of frauds. Initially, clustering model was adopted to categorize the authorized and deceitful operation by means of data clusterization of areas of factor value. Furthermore, Gaussian mixture model is used to model the possibility thickness of credit card operator's past performance such that the chance of present actions can be intended to perceive any irregularities from the historical behavior. Finally, Bayesian networks are used to define the measurements of a specific user and the pointers of different scam circumstances.

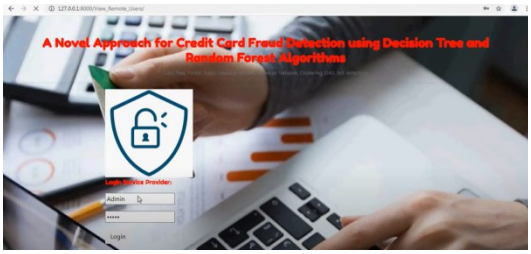
Advantages

1) The proposed system offered several innovative approaches that have vastly increased the efficiency of cyber threat identification.
2) The system is more effective due to presence of Random Forest based Credit Card Fraud Detection Algorithm using Machine Learning.

IV.MODULES

- **Service provider**

In this module, the service provider has to login by using valid user name and password.



After login successful he can do some operations such as browse datasets and train & test data sets,view trained and tested accuracy in bar chart,



view trained and tested accuracy results,



view predicted type, view type ratio, download predicted data sets, view type ratio results, view all remote users.

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- **View and authorize users**

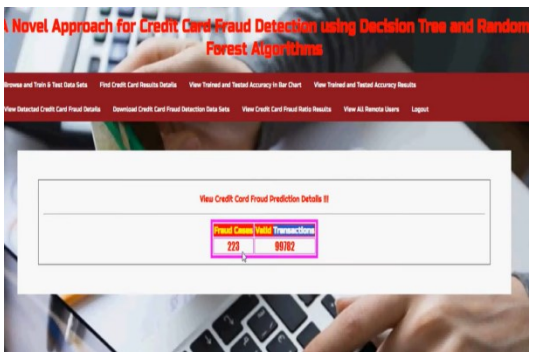
In this module, the admin can view the list of users who all registered. In this, the admin can view the user's details such as, user name, email, address and admin authorizes the users.

- **Remote user**

In this module,User should register before doing any operations. Once user registers, their details will be stored to the database.



After registration successful, he has to login by using authorized user name and password. Once login is successful user will do some operations like register and login, after login we have to predict type,





view your profile.

V.CONCLUSION

In conclusion, the novel approval approach for credit card fraud detection using Decision Tree and Random Forest algorithms offers a promising solution to the persistent challenge of fraudulent activities in the financial industry. By leveraging machine learning algorithms, financial institutions can enhance their fraud detection capabilities and protect consumers' assets from unauthorized transactions. The transparency and interpretability provided by Decision Tree models, along with the accuracy and robustness of Random Forest models, make them valuable tools in identifying fraudulent transactions while minimizing false positives and false negatives.

This project contributes to advancing the field of credit card fraud detection by introducing a data-driven approach that can adapt to evolving fraud patterns in real-time. Through experimental evaluation using real-world credit card transaction data, the effectiveness of the

Decision Tree and Random Forest algorithms in detecting fraudulent activities is demonstrated. The results of the experiments underscore the potential of machine learning techniques in improving fraud detection accuracy and efficiency, thereby safeguarding the financial interests of both financial institutions and consumers.

Overall, the proposed approach represents a significant step forward in the ongoing efforts to combat credit card fraud and enhance financial security. By integrating Decision Tree and Random Forest algorithms into fraud detection systems, financial institutions can better identify and prevent fraudulent transactions, reducing financial losses and enhancing customer trust and satisfaction.

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