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Study on Fraud Transaction Detection System

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Abstract: *Fraudulent transactions are very common problem in banking systems internationally, accounting for $5.1 trillion dollars every year. Many financial institutions are facing the common problem of being targeted by transactions of fraudulent nature and its becoming more and more obvious that advanced technology, such as Machine Learning (ML) is needed to counter such acts. Machine learning is the most effective technique against these complex bank frauds when approaches relying on fragmented and siloed data, rules-based approaches or traditional point-solutions are not only costly but also not as effective as needed. Complex algorithms powered by ML can be used to reduce manual investigations in Financial Institutions. Volume of these transactions is huge, lots of current solutions do not focus on big data the proposed model will work on big data with the help of 'Apache Spark' using latest machine learning technology. The proposed model will try to find pattern in given data set and flag the transaction as fraudulent or not with probability score and then banking system can decide further course of action. We are also going to include different machine learning algorithms used to detect fraudulent transactions and provide a comparative study between those algorithms to show which is more effective.*

Keywords: Machine Learning, Algorithms, Credit Card, Fraud Detection, Transaction

I. INTRODUCTION

In this day and age where the world is progressing at a much faster rate than before, the biggest reason behind this is extensive trading, online purchasing, online money transfer, etc. Due to such services the use of physical cards(Credit Cards) is becoming more and more important. As the use of credit cards is increasing so are the chances of frauds being committed. In credit card transactions, 'fraud' refers to the unlawful and unwelcome use of an account by someone who is not the account's owner. Frauds can be committed in any number of ways, for example –

- The credit card being stolen.
- Account takeover.
- Frauds being committed through credit card information don't require access to the physical card.
- Identity Theft - When a fraudster obtains the personal information/credit card information of a victim.
- Identity theft constitutes 71% of the most common type of fraud.

These kind of frauds are hard to detect using dated technology so we turn to advanced technology such as Machine Learning (ML). some other techniques besides ML are to flag transactions of large amount to detect fraudulent transactions, limiting the number of fraud attempts a customer can have at a transaction, etc, these techniques work to some extent but are not as effective as ML. Fraudulent transactions are so complex that there is no standard method to prevent these transactions but ML can be used to identify these transactions. So with the help of different machine learning algorithms we can train the model and flag the transactions as fraudulent or not, with probability, by feeding it existing fraudulent transaction data.

There are several ways for detecting fraud, each of which aims to boost detection rates while reducing false alarm rates. For fraud detection, several approaches have been utilised, such as the Bayesian algorithm, K-Nearest Neighbour, Support Vector Machine, and so on. The two primary kinds of statistical fraud detection tools are supervised and unsupervised. Models are calculated based on samples of fraudulent and valid transactions in supervised fraud detection approaches to categorise new transactions as fraudulent or genuine. Outliers or irregular transactions are discovered as suspected fraudulent transactions in unsupervised fraud detection. Both of these fraud detection algorithms can forecast the likelihood of a transaction being fraudulent. The objective of this project is to perform a comprehensive review of different fraud detection algorithms and use them to develop a fraudulent transaction detection system.

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II. LITERATURE REVIEW

Abhay Goel et al. (2020) [1] On the PCA processed Credit Card Transaction data, they used their research to focus on analysing and preparing data sets, as well as the implementations of several anomaly detection techniques such as the Local Outlier Factor and Isolation Forest algorithm. This python programme is also developed using Jupyter notebooks. It contains some useful information on pre-processing datasets as well as the implementation of numerous anomaly detection techniques, such as their local outlier factor and isolation forest methodology.

Massimiliano Zanin et al. (2018) [2] They look at the possibilities of employing complex networks to improve credit card fraud detection in their submission. Specifically, parenclitic networks are utilised to synthesis complicated features describing card transactions, based on a recently developed technique. Then, using a large dataset of real transactions, their usefulness is assessed by comparing the increase in classification score obtained when compared to the usage of a typical ANN method. They also demonstrate that in some instances, a combined data mining/complex networks method may outperform a commercial solution.

Masoumeh Zareapoor et al. (2015) [3] They investigated the performance of five cutting-edge credit card fraud prediction techniques: Support Vector Machines (SVM), Nave Bayes (NB), KNN, and the Bagging ensemble classifier. The majority of their explanation is brief, with the exception of three of the five techniques that were used in an experiment. Their study compared three state-of-the-art data mining algorithms, including a bagging ensemble classifier based on the decision three algorithm, which is an unique methodology in the field of credit card fraud detection. Their rating is based on a real-world dataset of credit card transactions. They discovered that because the bagging classifier based on decision three is independent of attribute values, it performs well with this type of data.

Shailesh S. Dhok et al. (2012) [4] They have proposed using a Hidden Markov Model (HMM) to detect credit card fraud. The underlying stochastic process of an HMM is used to describe the many phases in credit card transaction processing. They employed transaction amount ranges as observation symbols, whereas item categories were considered HMM states. They also proposed a method for determining cardholder spending profiles, as well as using this information to determine the value of observation symbols and an initial estimate of model parameters. It was also discussed how the HMM can determine whether or not an incoming transaction is fraudulent.

S P Maniraj et al. (2019) [5] Their post included a summary of the most prevalent types of fraud, as well as strategies for detecting them, as well as an overview of recent research in the topic. Their study also includes a detailed description of how machine learning may be used to improve fraud detection findings, as well as the method, pseudocode, implementation explanation, and test results.

Munira Ansari et al. (2021) [6] The major goal of their research is to create a Credit Card Fraud Detection warning system to protect individuals from credit card online fraud. The Hidden Markov Model is used to create this detection model. The primary goal of a credit card fraud detection system is to keep our transactions and security safe. Fraudsters won't be able to conduct repeated transactions on a stolen or counterfeit card before the cardholder notices the fraudulent activity with this approach. Their algorithm is then utilised to determine whether or not a new transaction is fraudulent.

Shashank Singh et al. (2021) [7] Their study also includes a detailed description of how machine learning may be used to improve fraud detection findings, as well as the algorithm, pseudocode, implementation explanation, and experimental results. While the method achieves a precision of over 99.6%, when only a tenth of the data set is considered, it only achieves a precision of 28%. When the complete dataset is given into the system, however, the accuracy increases to 33%. Due to the large disparity between the number of legitimate and authentic transactions, this high percentage of accuracy is to be expected.

M. Ramya et al. (2020) [8] They identified ideal algorithms to combat four key types of frauds based on research, experimentation, and parameter tweaking, all of which are employed in the process. They feel that because the produced machine learning models have an average level of accuracy, they should concentrate on increasing prediction levels in order to obtain a better forecast.

Philip K. Chan et al. (1997) [9] On real-world data, their research examined a variety of machine learning algorithms as well as meta-learning methodologies. Unlike many reported experiments on "standard" data sets, their efforts in this domain seek to represent the real-world environment and problems. According to the findings, a 50/50 distribution of fraud/non-fraud training data produces classifiers with the greatest True Positive rate and the lowest False Positive rate.

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Vladimir Zaslavsky et al. (2006) [10] Using the self-organizing map method, this research proposes a new way to transaction monitoring and credit card fraud detection. It allows for the automated Creighton of transaction monitoring rules in a learning process, as well as their continual improvement in an automated system with constantly changing information.

III. Future Scope

After Reviewing various papers we have come to the conclusion that Machine Learning will play a vital role in solving financial problems of illegal nature in future. In this review we can see that there are various methods that can be used through machine learning to solve those financial problems efficiently and more accurately. The topic of using Machine Learning to stop financial problems or more specifically in our case Credit Cards has been around for quite some time. Just the idea itself has been published as far back as 1997 which is one of the papers in this review [9] which tackles this idea by trying to highlight the challenges and different methods that are applicable. In an environment of dynamically changing information, everything related to a transaction basically exist in some form that can be used in a dataset to train all kinds of Machine Learning models, as finding patterns in dataset is becoming more and more efficient. The point of this review is to try and find out both the practicality and the scope of the idea and what it might lead to in future.

As of right now companies and big corporations are reluctant to share real world data as there is huge risk in doing so but in future corporations may be more willing to share real world data or help with forming more accurate pseudo real world data which will lead to more accurate solutions on a larger scale. In future detecting fraud won't just be up to the banks and corporations but it will also be available in some form to the masses to safeguard their transaction on their own and would probably be of more help to the organizations in their own way.

IV. Conclusion

As technology is advancing in various fields, so is the number of frauds being committed. Credit card fraud is without a doubt an act of criminal dishonesty which is being committed more and more. In order to tackle/reduce the number of frauds being committed we have to use a more powerful system which can identify the transaction as fraud or normal. This system will help reduce human efforts and manpower needed to detect fraudulent transactions as it is more accurate and saves a lot of time.

This is where this project uses different algorithms using machine learning to develop a fraud detection system which is explained in detail in the report. Then adding another supervision system which keeps an eye on different transactions from different credit cards and based on the records the system has it decides the probability of the transaction being fraud or safe. Models are regularly updated with fresh data and feature extraction, resulting in efficient resource use. As a result, the user will have a variety of security levels, which will assist in identifying fraudulent transactions after the security has been penetrated.

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