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ANALYSIS ON CREDIT CARD FRAUD DETECTION TECHNIQUES BY MACHINE LEARNING APPROACH

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Abstract-

Use of online transactions in day to day life has been increasing since the last decade due to advances in technology and network connectivity. Due to the ease, simplicity and user friendliness of online transactions, new users are constantly joining the vast population which benefitted from such system. Credit card is one of the most divisive products among all available financial tools. Besides being convenient, there are credit card frauds which are becoming main threat for the users. This paper is focused on analysis of five papers. In this paper, we have studied different fraud detection techniques and presented the techniques thoroughly.

Keywords—Fraud Detection, Credit Card, Machine Learning, Data Set, Artificial Neural Network.

I. INTRODUCTION

In this digital world, the credit card is one of the most divisive products among all available financial tools. Credit card becomes popular mode of payment for both online and offline purchase. Besides being convenient, there are some credit card frauds which become main threat for the users. Credit card frauds are increasing day by day. The fraudulent transactions are scattered with genuine transactions. The Fraud Detection can be detected by using various machine learning algorithms. The algorithms vary with their accuracy and the ease of usage. The algorithms tend to be effective in detecting the frauds which happen over the credit card and other online transactions. The fraud detection helps to eliminate the problems occurring to the customers of the specific credit card. Hence to remove this trouble, many methods are developed that tends to remove the problems in this regard.

II. BACKGROUND

The credit card fraud increases every year and is regarded as one of the important issues in the credit card institutes and corporations. Therefore, fraud detection is considered as an important research challenge in today's life. Fraud reduction is complicated process requiring the body of knowledge in many scientific fields. Based on the kind of the fraud, the banks or the credit card institutes face different measures may be taken. In recent years, several studies have used machine learning and data mining technique to provide solution to this problem. The schemes and techniques used for fraud detection are:

Credit Card Fraud Detection dataset was used in this research. Because the dataset was highly imbalanced, SMOTE technique was used for oversampling and other testing purpose [1]. Many Machine learning algorithms are used to detect credit card fraud. Standard models are used first. Then, hybrid methods which use AdaBoost

and majority voting methods are applied to detect the frauds [2]. The techniques that are used for fraud detection are as follows: KNN, Naïve Bayes, Logistic Regression, Chebyshev Functional Link Artificial Neural Network (CFLANN), Multi- Layer Perceptron and Decision Trees which are evaluated on basis of their result evaluated in terms of various accuracy metrics [3]. A Big data analytical framework to process large volume of data and implemented various machine learning algorithms for fraud detection and observed their performance on benchmark dataset to detect frauds on real time basis there by giving low risk and high customer satisfaction [4]. A state of art on various fraud techniques is proposed as well as detection and prevention techniques such as classification, clustering and regression [5].

The paper is organized as follows: **Section I** Introduction. **Section II** discusses Background. **Section III** discusses previous work. **Section IV** discusses existing methodologies. **Section V** discusses attributes and parameters and how these are affected on mobility models. **Section VI** discusses outcome of result. Finally **Section VII** Conclude this analytical paper.

III. PREVIOUS WORK DONE

Currently, the use of credit card is on a daily basis. This provides an ease to the customers and therefore the use of credit cards is increasing on a daily basis. The frauds related to the credit cards are also increasing. The frauds refer to the transaction problems occurring on a daily basis. The previous work done on this topic is as follows:

Dejan Varmedja et al. (2019) [1] has Proposed a model that can be used for detection of other irregularities. The model can be used to detect and prevent the frauds that occur on credit cards. Kuldeep Randhawa et al. (2018) [2] has used machine learning algorithms to detect the frauds. The algorithms are used on the fraud detection data set and also prove to be effective in detecting the frauds. Deepti Dighe et al. (2018) [3] has used many fraud detection techniques which are evaluated on basis of their result evaluated in terms of various accuracy metrics. Suraj Patil et al. (2018) [4] has proposed a robust framework to process large volume of data,the functionality of framework can be extended to extract real time data from different desperate sources. I Sadgali et al. (2018) [5] has proposed a state of art on various on various fraud techniques, as well as detection and prevention techniques proposed such as classification, clustering and regression. The aim of this study is to identify the techniques and methods that give the best results. Sinayobye Janvier Omar et al. [2018] reviews the existing research that is done in the fraud detection across different areas with the aim for investigating the machine learning techniques used and find out their strengths and weakness [6]. Thushara Amarasinghe et al. [2018] have review the selected machine learning and outlier detection techniques that can be integrated into a fraud detection system for financial transactions [7]. Alex G.C. de Sá et al. [2018] has presented Fraud-BNC, a customized Bayesian Network Classifier (BNC) algorithm for a real credit card fraud detection problem. The task of creating this Fraud-BNC was automatically performed by Hyper-Heuristic Evolutionary Algorithm, which organize the knowledge about the BNC algorithms into taxonomy and searches for the best combination of these components for a given dataset [8]. Ishan Sohony et al. [2018] has presented an ensemble a method which is based on a combination of random forest and neural network – which keeps the best of both worlds, and is able to predict with high accuracy and confidence the label of a new sample [9].

IV. EXISTING METHODOLOGIES

Many techniques and schemes have been implemented over the last several decades. Some techniques seems to be accurate as well as helps in the fraud detection of the credit cards. The techniques are helpful if they can detect the frauds beforehand or may result into the system breakdown.

A) *SMOTE Technique:* Credit Card Fraud Detection dataset was used in the research. Because this dataset was imbalanced, the SMOTE technique was used for oversampling. Further, feature selection was performed which required the dataset to split into two parts viz, training data and test data. The algorithms used in the experiment were Logistic Regression, Random Forest, Naive Bayes and Multilayer Perceptron. Result shows that each tested algorithm can be used for credit card fraud detection with high accuracy. Proposed model can be used for detection of other irregularities. Hence, comparison was made and it was established that Random Forest algorithm gives the best results i.e. best classifies whether transactions are fraud or not [1].

B) *Machine Learning Algorithms:* Machine learning algorithms are used to detect credit card fraud. Standard Models are used first. For credit card fraud detection, Random Forest (RF), Support Vector Machine, (SVM) and Logistic Regression (LOR) were examined. Then, hybrid methods that use AdaBoost and other majority voting methods are applied. To evaluate the model efficacy, a data set which is available publicly is used. Then, a real-world credit card data set from a financial institution is analyzed. In addition, some noise is added to the data samples to further assess the robustness of the algorithms. The experimental results indicate that the majority voting method achieves good accuracy rates in detecting fraud cases in credit cards [2].

C) *Neutral Network:* Previously used techniques largely include use of Logistic Regression, Decision Trees, KNN and Naïve Bayes. The neural network algorithms models show higher as compared to other models. But it also requires some significant amount of work to achieve better results than previous ones with respect to adjustment of hidden layers, deciding the optimum network size, modifications to the input values, etc. The Neural Networks Algorithms are as follows: Chebyshev Functional Link Artificial Neural Network (CFLANN) is a single layer neural network. The Chebyshev orthogonal function expands the original input into higher dimensional space. Multi-Layer Perceptron (MLP) is a neural network which is used in maximum problem solving cases using neural networks because it can approximate a non-linear function. It contains an input layer, multiple hidden layers and one output layer [3].

D) *A Big Data Analytical Framework:* A Big data analytical framework is proposed here to process large volume of data and implemented various machine learning algorithms for fraud detection and observed their performance on benchmark dataset to detect frauds on real time basis there by giving low risk and high customer satisfaction. The proposed system is used to detect the frauds on real time basis by analyzing incoming transactions. the functionality of framework can be extended to extract real time data from different desperate sources. The extracted data is then used to build strong analytical model. [4]

V. ANALYSIS AND DISCUSSION

Credit Card is a wide range term that is used in terms of theft or fraud committed using or involving credit cards as a fraudulent source of funds in some transactions. The purpose may be to obtain unauthorized funds from a specific account. A detailed appraisal of the major requirements of efficient Fraud Detection solutions and the factors governing these requirements is provided. There are many fraud detections techniques available. The

techniques prove to be effective in detecting and preventing this fraud. The techniques includes Machine Learning algorithms and Neural Network Algorithms that helps in detecting the frauds that occur with the credit cards. Many algorithms are involved in this method and new methods are designed in order to save the frauds from occurring. In terms of machine learning algorithms, Random Forest Algorithm is the best one to detect the frauds [1]. Many Algorithms were compared and it was found out that the Random Forest Algorithm is responsible for Fraud Detection at a better rate. Also it was found out that hybrid methods which are combination of two or more methods prove to be more effective in detecting the Frauds [2]. The Hybrid Methods have higher effectiveness and higher accuracy as compared to single methods. KNN is another method that can be used to detect the frauds and also the effectiveness of fraud detection is maintained [3]. Also the Neural Networks can be used to detect the Frauds and maintain the complexities related with the fraud detection and other mechanisms. As in nowadays the data is available in terms of petabytes, which is unable to process meaning requiring much time. So to avoid this The Big Data Analytical Framework is used for accessing the data and detecting the Frauds [4]. The Fraud Detection is a hotspot in terms of credit cards as improving the security helps to find out more and more customers which will be profitable to the banks and other organizations which tend to provide this service to the customers.

TABLE 1: COMPARISONS BETWEEN DIFFERENT SCHEMES.

Proposed scheme and techniques	Advantages	Disadvantages
SMOTE Techniques	This technique helps to improve feature selection, data balancing and over sampling.	Difficult to use it with stacked data.
Machine Learning Algorithms	Algorithms have good accuracy rates.	The algorithms are not as effective as in real time.
Neural Network Algorithms	Imbalanced data can be handled properly by using the Neural Network.	The results are not as accurate as machine learning algorithms.
Big Data Analytical Framework	Can easily process large amount of data for fraud detection.	As it uses random forest algorithm, the problem of Over Fitting of trees arises.

VI. OUTCOME AND POSSIBLE RESULT

Credit Card Frauds occur on a high level as the thieves try to alter the amount present in the bank to their accounts and due to which the customers face many problems regarding this issue. This can be solved by detecting the frauds and also preventive measures need to be found out to save the frauds. Many Techniques are available that helps to prevent the frauds from taking place.

VII. CONCLUSION

This paper is focused on analysis of different techniques and systems such as Machine Learning Algorithms, SMOTE Technique, Hybrid Technique, Neural Network Algorithm and big data analytical framework.This techniques uses many algorithms and helps to prevent the frauds that occur with credit cards. This techniques are easier to apply and also provide good accuracy to the customers in detecting frauds.

VIII. FUTURE SCOPE

From observations of the methods the future work will include the implementation of the prevention model and to prevent Credit Card Frauds.

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