

A Survey of Online Credit Card Fraud Detection using Data Mining Techniques

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Abstract—Nowadays the use of credit card has increased, because the amount of online transaction is growing. With the day to day use of credit card for payment online as well as regular purchase, case of fraud associated with it is also rising. To reduce the huge financial loss caused by frauds, a number of modern techniques have been developed for fraud detection which is based on data mining, neural network, genetic algorithm etc. Here a survey of techniques for online credit card fraud detection using Hidden Markov Model, Genetic Algorithm and Hybrid Model, and comparison between them has been shown.

Key words: Credit Card, Fraud Detection, Hidden Markov Model, Genetic Algorithm, Hybrid Model Etc

I. INTRODUCTION

Credit card is a small plastic card which is issued to users as system for payment [1]. It allows cardholders to purchase goods and services based on the cardholder's promise. Nowadays the use of credit card has increased because of the amount of online transaction is growing. Today, almost every credit card carries an identifying number that helps in shopping transaction fast. As credit card is used for payment online as well as regular purchase, case of fraud associated with it are also rising. Fraud is unauthorized activity made for personal gain or to damage another user/individual [2]. Authorized user are permitted for credit card transactions by using the parameters such as credit card number, signatures, card holder's address, expiry date etc. Illegal use of card or card information without the knowledge of the cardholder itself and thus is an act of criminal deception refers to credit card fraud. There are two types of credit card fraud: offline fraud and online fraud. Offline fraud is committed by using a stolen physical card at call center or any place [7]. Online fraud is committed via internet, phone, shopping, and web or in absence of card holder. In online payment mode, attacker need only little information like secure code, card number, expiration date etc. for doing fraudulent transaction [7]. Credit card fraud detection techniques are developed to reduce the huge financial loss caused by frauds. Fraud detection involves monitoring the behavior of users in order to detect or avoid undesirable behavior. There are number of techniques have been developed for fraud detection based on data mining, neural network, genetic algorithm etc.

Fig. 1 shows the general scenario of credit card fraud detection system. Here first step is to start and login into a particular site to purchase goods and services. And then go to the payment mode where credit card information (credit card number, credit card cvv number, credit card name, expiry date etc.) is necessary. Then personal identity number (PIN) is asked for the verification. It also checks whether the account balance of user's credit card is more than the purchase amount or not. After the verification fraud detection system is activated. It concluded whether the

transaction is fraudulent or not. If it concluded that the transaction is fraudulent then security question/answer which was given at the time of registration is asked and if it concluded that the transaction is not fraudulent then it is direct given permission for transaction. At the end system is terminated.

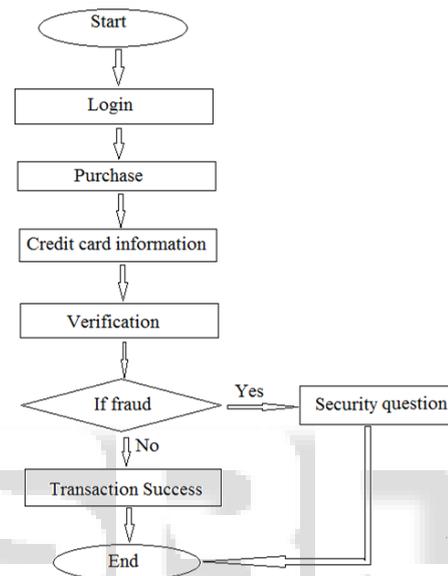


Fig. 1: Architecture of credit card fraud detection [7]

There are many data mining techniques for fraud detection like hidden markov model, genetic algorithm, hybrid model etc.

II. LITERATURE SURVEY

A. Hidden Markov Model:

Hidden markov model is the best techniques to detect online credit card frauds. HMM is initially trained with the normal behaviour of a cardholder [1]. It will be helpful to find out the fraudulent transaction by using user's spending profiles which can be divided into major types: (1) Lower profile (2) Middle profile (3) Higher profile. It stores the data of different amount of transactions in form of clusters depending on transaction amount which will be either in low, medium or high value ranges and identify the spending profile of cardholder. If the spending habit of the user is determined to be having some different spending habits or there is large amount of expenditure going on suddenly. So an incoming credit card transaction is not accepted by the trained Hidden Markov Model with sufficiently high probability, it is considered to be fraudulent transactions. The HMM uses the k-means algorithm for clustering purpose and Baum welch algorithm for training purpose [1].

Hidden markov model reduces the work of employee in bank since it maintains a log of transaction. It produces high false alarm as well as high false positive [4].

Fig. 2 shows the working process of hidden markov model for credit card fraud detection.

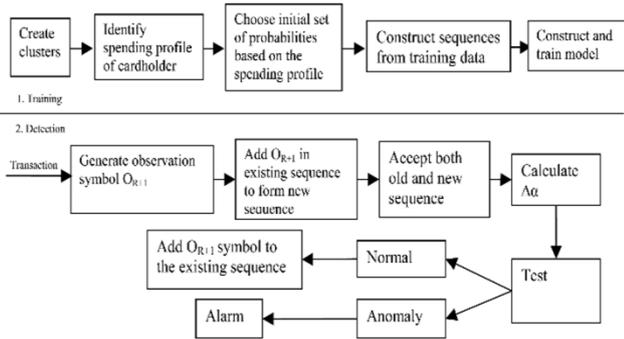


Fig. 2: Working process of hidden markov model [5]

B. Genetic Algorithm:

Genetic algorithms are evolutionary algorithms which aim at obtaining better solutions. There are many parameters are involved in dataset for credit card fraud detection.

CC freq = number of times card used

CC loc = location at which credit cards in the hands of fraudsters

CC overdraft = the rate of overdraft time

CC bank balance = the balance available at bank of credit card

CC daily spending = the average daily spending amount

The experimental process of genetic algorithm for credit card fraud detection has four steps:

- Input group of data for credit card transactions. Get the sample of data finally, which includes the confidential information about the card holder, store in the data set.
- Compute the critical values, Calculate the CC usage frequency count, CC usage location, CC overdraft, current bank balance, average daily spending.
- Generate critical values found after limited number of generations. Critical Fraud Detected using Genetic algorithm.

1) Generate Fraud Transactions using this Algorithm.

Using genetic algorithm the fraud is detected and the false alert is minimized and it gives a good performance [2].

C. Hybrid Model:

Hybrid model is a combination of hidden markov model, behaviour based technique, genetic algorithm.

In hidden markov model, it works on spending profile of cardholder which can be divided into lower profile, medium profile and higher profile. The problem with this approach is that it maintains log for previous transaction. So many times false fraud are detected.

So in hybrid model, each and every transaction is tested individually with this model which use hidden markov model, behaviour based technique, genetic algorithm. So by testing with all three method, values are obtained in each case which is either in 0 or 1. Their average value is taken out. If the average is greater than 0.4 then fraud is detected [3].

III. COMPARATIVE ANALYSIS

I have compared techniques hidden markov model, genetic algorithm and hybrid model with some parameter like true positive (TP), false positive (FP), cost, accuracy etc.

A. True Positive (TP):

It represents the fraction of fraudulent transaction correctly identified as fraudulent and genuine transactions correctly identified as genuine [4].

B. False Positive (FP):

It represents fraction of genuine transactions identified as fraudulent and fraudulent transactions identified as genuine [4].

C. Accuracy:

It represents the fraction of total number of transaction (both genuine and fraudulent) that has been detected correctly [4].

Parameter		Hidden Markov Model	Genetic Algorithm	Hybrid Model
Fraud Detection	TP%	Low [4]	High [4]	High [3]
	FP%	High [4]	Low [4]	Low [3]
Training required		Yes [1]	Yes [2]	Yes [3]
Cost [4]		Quite Expensive	Highly Expensive	Highly Expensive
Accuracy [4]		Medium	High	Very High

Table 1: Comparison of various fraud detection method

Table 1. shows the comparison of various fraud detection method. From Table 1, it is said that hybrid model gives high true positive and low false positive than hidden markov model and Genetic algorithm. All this techniques has training required. Hybrid model is high expensive than hidden markov model and genetic algorithm. But hybrid model gives high accuracy than hidden markov model and genetic algorithm.

IV. CONCLUSION

If one of these or combination of algorithm is applied into bank credit card fraud detection system, the probability of fraud transactions can be detected soon after credit card transactions has been done. Genetic algorithm gives higher accuracy than hidden markov model. Also genetic algorithm gives high true positive (TP) and less false positive (FP) than hidden markov model. If we use hybrid model than we can get higher accuracy than hidden markov model and genetic algorithm.

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