

# Credit Card Fraud Detection using FPGA with K-NN Clustering

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**Abstract**— If the huge progression for the electronic commerce skill and advances in the communication networks. Credit card fraud detection is sprinkling all over the worldwide for succeeding in huge economic losses. In the machine learning Credit Card Fraud detection has been an interesting matter. Nowadays, the main reasons of expectant financial losses are credit card fraud detection that affect not only wholesalers but also separate customers. Due to huge promotion in credit card dealings that is the credit card fraud detection has convert more and more widespread in current centuries. Grouping model, Decision tree, frequent pattern Genetic algorithm (FPGA) are the proposed approaches to notice credit card fraud detection. In the presented system for the data mining technology, organization models that is founded on decision trees and FPGA are functional on credit card fraud detection problematic. In the operation of this method in credit card fraud detection systems, financial losses due to fake dealings can be reduced more.

**Key words:** Data Mining, Decision Tree, Credit Card Fraud Detection (CCFD), Internet, E-Commerce Security, FPGA

## I. INTRODUCTION

Credit card fraud detection is defined as “Unauthorized account activity by a person for whom the account was not intended. Operationally, this is an event for which action can be taken to stop the abuse in progress and incorporate risk management practices to protect against similar actions in the future”. Credit Card Fraud Detection can be defined as that is an individual usages additional individual’s credit card for particular details though the proprietor of the card and the credit card problem are not alert of the detail which the credit card is being used. And the people using the credit card it is not at all having the linking with the cardholder and has no purpose of making the refunds for the buying was completed. Fraud detection includes classifying Fraud detection as rapidly as conceivable after it has been committed. Credit Card Fraud detection approaches are unceasingly industrialized to protect offenders in adapting to their approaches. The growth of novel fraud detection approaches for the extra difficult due to the simple restriction of the interchange of concepts in fraud detection. Record sets are not complete accessible and results are often not revealed to the community. The fraud detection cases have to be noticed from the obtainable enormous data sets such as the recorded data and operator performance. At current, fraud detection is to be applied by a total amount of methods such as data, artificial intelligence and data mining. Fraud detection is exposed from irregularities in records and designs. There are different kinds of methods for obligating credit card frauds are defined below

## II. KINDS OF FRAUDS

There are several kinds of frauds that includes are credit card frauds, telecommunication frauds, computer intrusions, Bankruptcy fraud, Theft fraud or counterfeit fraud, Application fraud and Behavioral fraud [1].

### 1) Credit Card Fraud:

The Credit card fraud is divided into 2 types: Offline fraud and another is On-line fraud. Offline fraud is dedicated by using a pinched corporeal card at call center or any other residence. On-line fraud is dedicated are internet, shop, telephone, web, or in presence of card holder.

### 2) Telecommunication Fraud:

This is very important useful of telecommunication services to obligate other methods of fraud. Telecommunication Fraud are Customers, industries and communication service provider are the fatalities.

### 3) Computer Intrusion:

Computer Intrusion can be defined as the performance of incoming without permit or invite. It means that the potential opportunity of illegal effort to access Information, Operate Information Decisively. Interlopers can be from every atmosphere, the outsider and insider who distinguishes the design of the scheme [2].

### 4) Bankruptcy Fraud:

Which column attentions on bankruptcy fraud. The Bankruptcy fraud is defined as a credit card though existence inattentive. Bankruptcy fraud is one of the most complicated kinds of credit card fraud to expect [2].

### 5) Theft Fraud/ Counterfeit Fraud:

In which sector we attention on counterfeit fraud and theft fraud that are connected to one other. Counterfeit Fraud means that a credit card which is not yours. As presently the landlord give some response and communication the bank, the bank will take events to check the robber as initial as conceivable. Similarly, Theft fraud refers that when the credit card is used distantly; anywhere individual the credit card specifics are required [1].

### 6) Application Fraud:

As soon as somebody applies for a credit card with incorrect information which is called as application fraud. For noticing application fraud, two dissimilar conditions are to be categorized. When applications originate from similar employer with the similar information which is termed as replicas and other applications originate from dissimilar persons with similar information which is called as identity fraudsters.

## III. PROBLEM IDENTIFICATION

The problematic with creation industry through the Internet lies in the fact that neither the card nor the cardholder needs to be present at the point-of-sale. It is therefore impossible for the merchant to check whether the customer is the genuine cardholder or not. Payment card fraud has become a

serious problem throughout the world. Companies and institutions loose huge amounts annually due to fraud and fraudsters continuously seek new ways to commit illegal actions. The good news is that fraud tends to be perpetrated to certain patterns and that it is possible to detect such patterns, and hence fraud. In this paper we will try to detect fraudulent transaction through the decision tree along with the frequent pattern genetic algorithm. As we will see that Decision tree data classify properly. Genetic algorithm are used for making the decision about the network topology, number of hidden layers, number of nodes that will be used in the design of Decision tree for our problem of credit card fraud detection.

#### IV. PROPOSED IMPLEMENTATION

##### A. Decision Tree in Fraud detection

Decision tree are commonly used in credit card fraud detection. Decision tree is a flow based structure in which internal node represent an outcome of the test on an attribute and branch represents an outcome of the test and leaf node represent classes. Root node is the top most node of the tree. Decision tree predicts the output of the target variable based on one or more input variable. It can handle nonlinear and interactive effects of input variables.

##### B. K-Nearest Neighbour Algorithm

The concept of k-nearest neighbour can be used in many analogy detection techniques. Credit card fraud can be detected by using k-nearest neighbor algorithm. Here in KNN new transaction is classified based on the closeness i.e. distance. In KNN we classify any new incoming transaction by calculating closeness or distance to other transaction. If they are close then transaction is ok else the transaction is indicated as fraud.

##### C. Frequent patterns:

If the number of the patterns in the database (the frequency,  $f$ ) exceeds a given threshold, then all these patterns are called *frequent patterns* (FPs). In order to find these FPs, we can exclude “infrequent” elements from all conditional databases. This procedure greatly reduces the calculation time. The greatest benefit of this procedure is achieved if the elements in all conditional databases are ordered from the lowest frequency to the highest:  $f_i < f_m$ , when  $i < m$ . This ordering was used in the FP search algorithms based on tree construction. This ordering was also used in our algorithm. If conditional dataset are saved in the main memory in the form of integer arrays, the total size of conditional dataset used in our algorithm does not exceed one needed for realization of the algorithm. We explain this observation by making a simple estimate. Suppose that we work with a dataset in which the probability of appearance of each element is 0.5. In this case, all conditional dataset do not require more memory than the initial dataset  $B_0$ , if the dataset,  $B_0$ , is a one-dimensional array of integer numbers. If, for example, we consider transactions of the record type (for which each variable,  $X_i$ , can take several self-excluding values –  $x_{i1}, x_{i2}, \dots, x_{imi}$ ), then the full size of all additional dataset relative to  $B_0$  will become even smaller. The variables used require twice memory compared with the representation of  $B_0$  by integers, because every item of the dataset  $B_0$  is stored in an entry with two fields. The

efficiency of our algorithm is produced by (i) the extremely simple logical searching scheme, (ii) the avoidance of recursive procedures, and (iii) the usage of only one-dimensional arrays of integers.

##### D. Genetic Algorithm

Genetic algorithms are an evolutionary algorithm which provides better solutions as time progresses. Fraud detection has been usually in domain of Ecommerce data mining. GA is used in data mining mainly for variable selection and is mostly coupled with other data mining algorithms. Its combination with other techniques has a very good performance. GA is used in credit card fraud detection for reducing the wrongly classified number of transactions. And it is easily accessible for computer programming language implementations which make it strong in credit card fraud detection. But this method has high performance and is quite expensive.

#### V. RESULT

For the purpose of fraud detection, frequent pattern to describe the behavior of user are constructed. First, a k-mean neighbor is constructed to model behavior under the assumption that the user is fraudulent (F) and another model under the assumption the user is a legitimate (NF). The ‘fraud net’ is set up by using expert knowledge. The ‘user net’ is set up by using data from non-fraudulent users. During operation user net is adapted to a specific user based on emerging data.

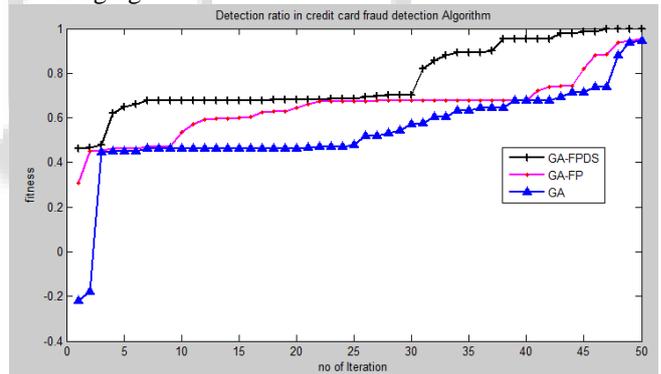


Fig. 5.1: Detection ratio in credit card fraud algorithm using GA, GA-FP and GA-FPDS

No of iteration	GA	GA-FP	GA-FPDS
0	0.19	0.3	0.49
5	0.42	0.42	0.68
10	0.42	0.42	0.5
15	0.42	0.59	0.5
20	0.42	0.61	0.5
25	0.42	0.61	0.5
30	0.45	0.61	0.5
35	0.46	0.61	0.9
40	0.61	0.61	0.91
45	0.62	0.81	0.99
50	0.81	0.88	1

Table 1: Comparative table between GA, GA-FP and GA-FPDS

From the above figure and table we can see that the proposed approach more efficient as compare to other algorithm for the fitness value.

## VI. APPLICATION

- 1) Provide easy and well security to Online Shopping
- 2) Detect Frauds and trace the Location from where the transaction has been made.

## VII. CONCLUSION

A novel fraud detection framework is proposed. Individual user's behavior pattern is dynamically profiled from the transactions by using a set of decision rules. An FP-GA (frequent pattern GA) structure and FP-tree growth algorithm are utilized to uncover these hidden association rules from the recent transactions for the user. The incoming transactions for that user are then compared against the profile in order to discover the anomalies, based on which the corresponding warnings are outputted. The FP-GA algorithm has been improved and used it for pattern matching. Unsupervised training and self-adjustment to changing user behavior make the proposed system effective for monitoring online transaction systems and provide fraud detection and protection.

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