INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH
AND ENGINEERING TRENDS

Credit Card Fraud Detection Using Hidden Markov Model

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Abstract: - **Credit card is the most popular mode of payment for both online as well as offline. The use of credit cards has increased day by day and a fraudulent transaction has also increased day by day in today's world. Credit card provides cashless shopping at every shop in the world. In Credit card fraud detection system, fraudulent transaction will be detected after transaction is done. Credit card fraud can be detected using Hidden Markov Model (HMM) during transactions. Hidden Markov Model is the tools for solve "hidden" problems. In this paper, the sequence of operations in credit card transaction processing system using a Hidden Markov Model and show how it can be used for the detection of fraud. Using Hidden Markov Model, the fraud detection processing system is trained with the standard procedures and spending patterns of a card user.**

Keywords- Hidden Markov Model (HMM).

I INTRODUCTION

The concept of using a card for purchases was described in 1887 by Edward Bellamy. ACNielsen study conducted in 2005, one-tenth of the world's population is shopping online. The credit-card users are allowed to purchase any materials or items to use in day to day life. Security of the credit card is depending upon the card details i.e., credit card user name and credit card number (called Bank Identification number). The credit cards can be used in two ways: 1) Physical Use (Offline Use) 2) Virtual Use (Online Use).

In a physical use or offline use, the card user presents his card physically for making a payment. Physical use of credit card is pay for his purchases in any shop personally. Offline credit card frauds are those where an individual's credit card is lost. If any attacker or hackers, hacks the details of credit card and use it to commit illegal actions is same as online credit card fraud.

In virtual or online use, the card owner uses the credit card to pay for purchased items online over the internet by just entering the details of credit card. Only some important information about a card (Credit card number, name, expiry date of credit card (month and year), CVV number, pin code, etc.) is required to make the payment. In online credit card fraud a fraudster simply needs to know the all details of credit card.

A Hidden Markov Model (HMM) in which the system is assumed to be a Markov process with invisible (hidden/ unobserved) states. A Hidden Markov Model can be represented as the simplest dynamic Bayesian Network. The mathematical calculations behind Hidden Markov Model were developed by L.E Baum and co-workers. Hidden Markov Model is a complete solution for detection of fraud transaction through credit card. A Hidden Markov Model is checking the normal behavior of a card user. The Hidden Markov Model uses the Shopping Price range:

1) High
2) Medium
3) Low

Credit card fraud techniques:
The different types of methods for committing credit card frauds are described below:

1) Lost/ stolen cards
2) Account takeover
3) Merchant related frauds
4) Internet related frauds

II LITERATURE SURVEY

Credit card fraud detection system has received significant consideration from researchers in the world. Some techniques have been developed to detect fraud using credit card which are based on neural network, data mining, Bayesian networks, clustering techniques, genetic algorithms etc.

Ghosh and Reilly proposed a neural network method to detect credit card fraud transactions. They built a detection system. These transactions contains sample fraud cases due to lost cards, stolen cards, application fraud, stolen card details, counterfeit fraud etc. They tested on a data set of all transactions of credit card account over a subsequent period of time.

The data mining technique has been in use from 1990. This technique was a very time consuming and difficult process to detect fraud transaction.

Bayesian networks are also one technique to detect fraud, and have been used to detect fraud in the credit card industry.
Bolton and Hand proposed an unsupervised credit card detection method by observing abnormal spending behavior and frequency of transactions.

All the information about credit card Like Credit card number, name, CVV number, Expiry month and year of credit card etc. When credit card user is entering the correct information then it will ask Personal Identity number (PIN). Then credit card fraud

detection system is matching of Personal Identity number with given account information, the fraud checking module i.e. Hidden Markov Model will be activated. Credit card fraud detection system it start the verification if user credit card has less than 10 transactions then it will directly ask to provide personal information to do the transaction. Once database of 10 transactions will be developed, then fraud detection system will start to work.

If the detected transaction is fraudulent then the Security information form will arise. It has a set of question where the user has to answer them correctly to do the transaction. If at least one answer is wrong then transaction is unsuccessful.

III SYSTEM ARCHITECTURE OF PROPOSED SYSTEM
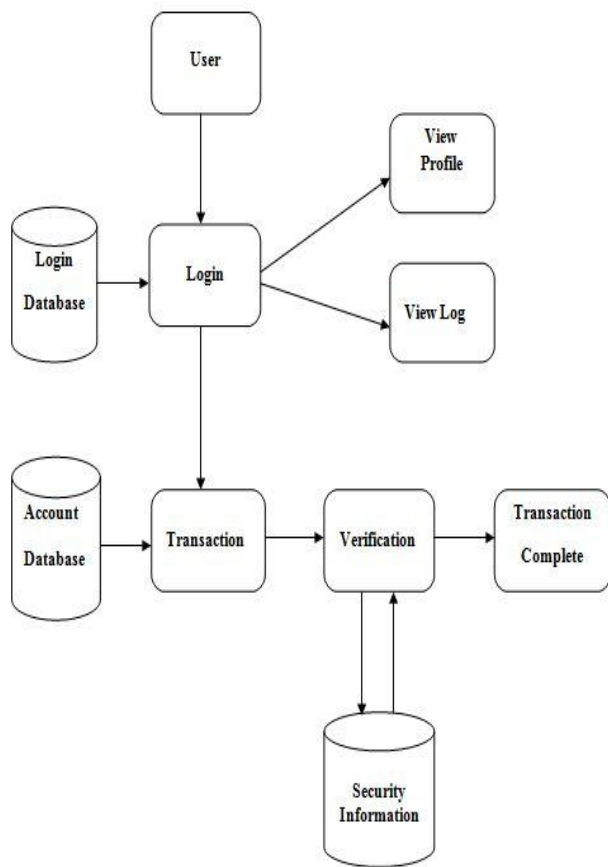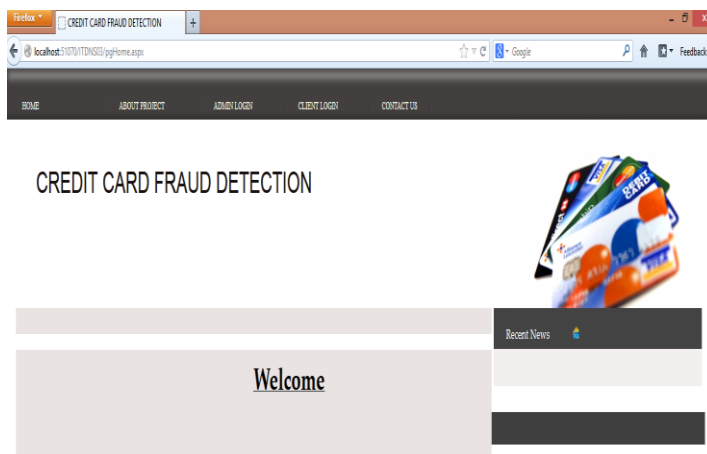
A. System Architecture

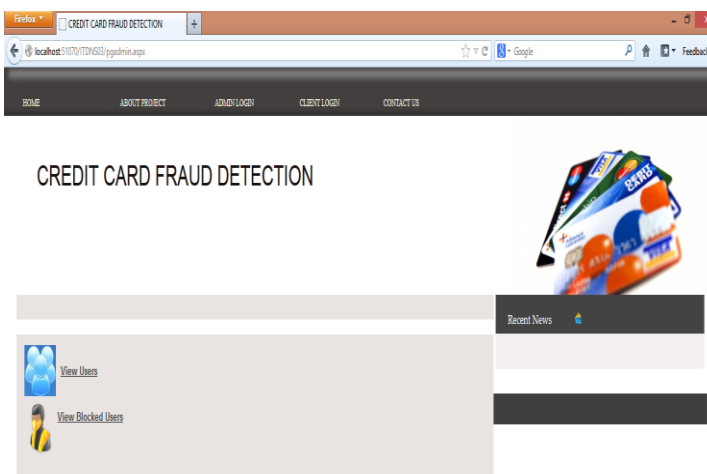*Figure 1.: System Architecture of Credit Card Fraud Detection*

The System architecture of the credit card fraud detection system using the Hidden Markov Model is represented above. It consists of a user module, login module, transaction module and verification module.
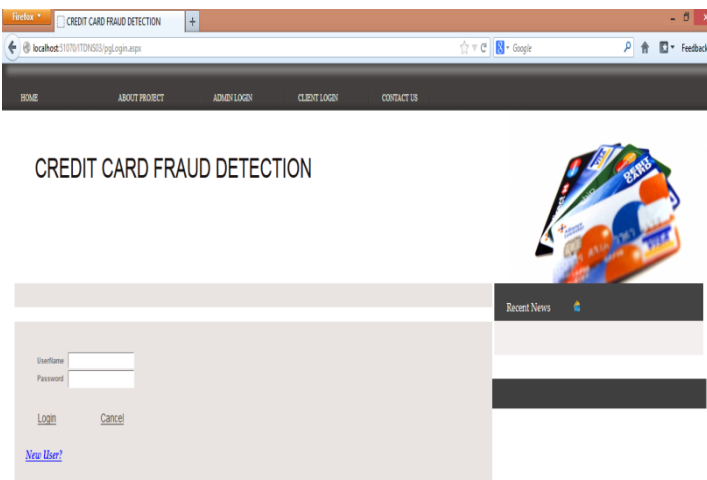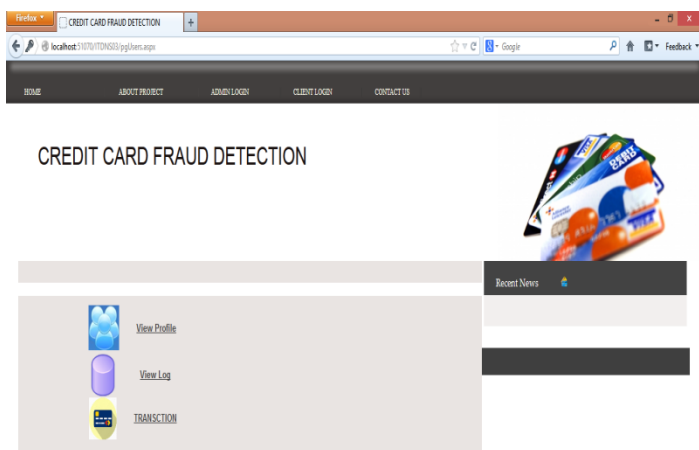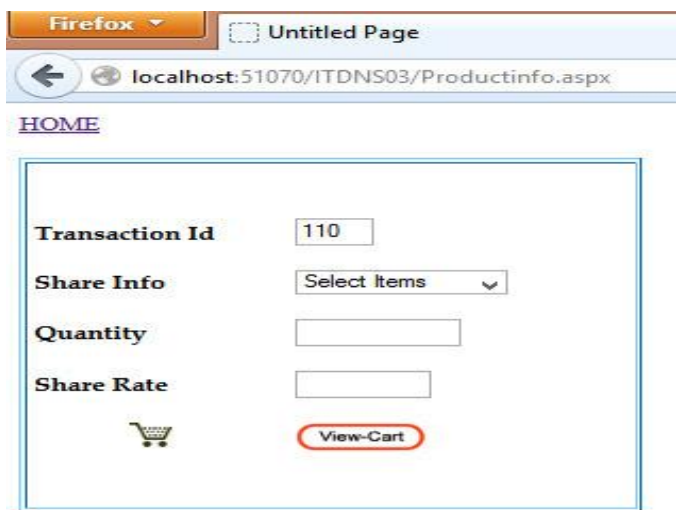
IV RESULT ANALYSIS

1.Home Page

2.Admin View

3.User Login

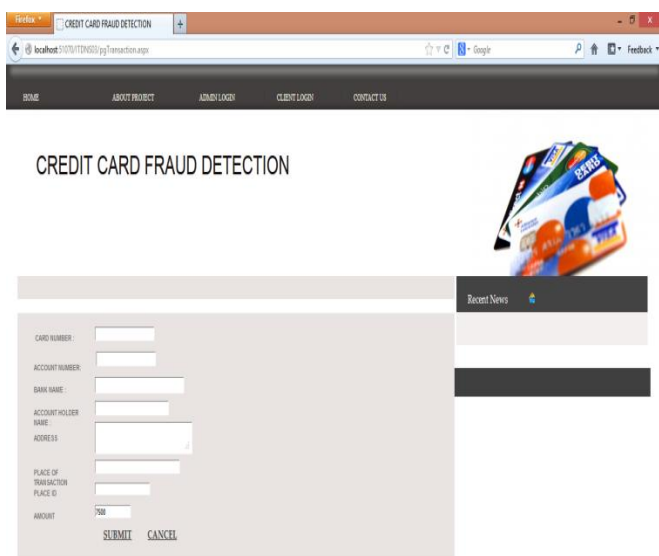*4.User View*

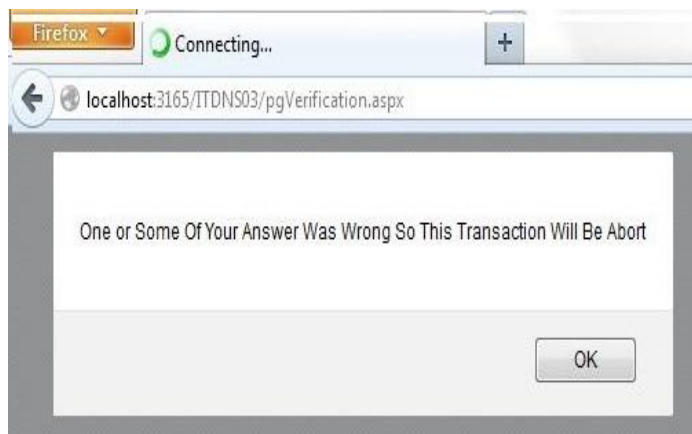*5.Product Info*

6.Transaction

7.Transaction Declined

Testing credit card fraud detection system using Hidden Markov Model is a difficult task. Banks do not agree to share their data with researchers. There is also no benchmark data available for experimentation. The card users are classified into three types as mentioned before the high, medium, and low range. When running the fraud detection system using hidden markov model, each incoming transaction is submitted to the system for verification. Figure illustrates that when the threshold is set to 0.4, the model has better recognition. As the improvement of true positive (TF), the false positive (FP) is also increased.
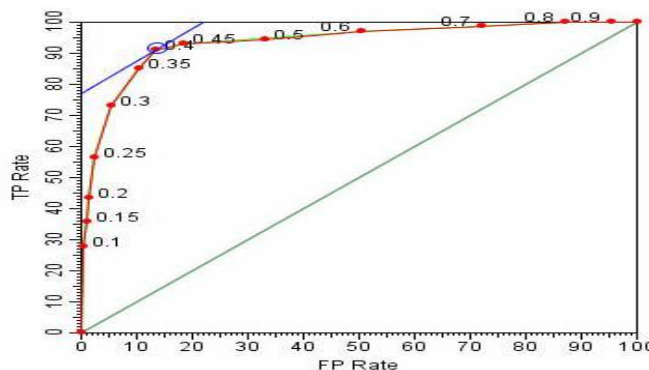
Accuracy represents the total number of transactions (both genuine and fraudulent) that have been detected correctly. It can be calculate as follows:

$$\text{Accuracy} = \frac{\text{No. of good transactions} + \text{No. of bad transactions}}{\text{Total no. of transactions}}$$

Credit card Fraud Detection System will be checked on last 10 transactions and also calculate percentage of each spending profile

(high, medium and low) based on total number of transactions.

Table 1: List of all transactions

No. of transaction	Amount	No. of transaction	Amount
1st	1000	11th	500
2nd	2300	12th	1500
3rd	2900	13th	3600
4th	1050	14th	7700
5th	900	15th	4000
6th	5600	16th	4400
7th	6700	17th	3700
8th	3300	18th	600
9th	4200	19th	1300
10th	5000	20th	7000

First position of the table denotes recent transaction and last position of the table is denotes first transaction.

V APPLICATION

- Provide easy and well security to Online Shopping.

- Online Banking.

- Detect Frauds and trace the Location from where the transaction has been made.

VI CONCLUSION

In this paper, it has been discussed that how Hidden Markov Model will facilitate to stop fraudulent online transaction and offline transaction through credit card. The Credit Card Fraud Detection System is also scalable for handling vast volumes of transactions processing. The Hidden Markov Model makes the processing of detection very easy and tries to remove the complexity. At the initial state Hidden Markov Model checks the upcoming transaction is fraudulent or not and it allow to accept the next transaction. The different ranges of transaction amount like high range, medium range, and low range as the observation symbols were considered. As a result, efficient credit card fraud detection systems are most requirements for card issuing banks and all type of online transactions and offline transaction that make use of credit cards. The Hidden Markov Model technique is used to detect various unobserved (hidden) activities on credit cards. It maintains a database, where past records of transactions are saved. The card user is notified through a system of messages if an unusual transaction, which differs very much from the previous records, is carried out. The Credit Card Fraud Detection System is also scalable for handling large volumes of transactions.

We implement the feature subset selection using graph based clustering to evaluate the performance, accuracy and capability of features from huge amount of data for that FAST algorithm to reduce memory usage. Fast Clustering based feature selection algorithm can be compared with existing feature algorithm. FAST get the first rank for Text data and second rank for image data as well as Microarray dataset. the response of FAST algorithm i.e. feature selection which is search algorithm.

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