CREDIT CARD FRAUD DETECTION USING ADABOOST AND MAJORITY VOTING

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ABSTRACT

Credit card fraud is a serious problem in financial services. Billions of dollars are lost due to credit card fraud every year. There is a lack of research studies on analysing real-world credit card data owing to confidentiality issues. In this paper, machine learning algorithms are used to detect credit card fraud. Standard models are firstly used. Then, hybrid methods which use AdaBoost and majority voting methods are applied. To evaluate the model efficacy, a publicly available credit card data set is used. Then, a real-world credit card data set from a financial institution is analysed. In addition, noise is added to the data samples to further assess the robustness of the algorithms. The experimental results positively indicate that the majority voting method achieves good accuracy rates in detecting fraud cases in credit cards.

1 INTRODUCTION

Fraud is a wrongful or criminal deception aimed to bring financial or personal gain [1]. In avoiding loss from fraud, two mechanisms can be used: fraud prevention and fraud detection. Fraud prevention is a proactive method, where it stops fraud from happening in the first place. On the other hand, fraud detection is needed when a fraudulent transaction is attempted by a fraudster. Credit card fraud is concerned with the illegal use of credit card information for purchases. Credit card transactions can be accomplished either physically or digitally [2]. In physical transactions, the credit card is involved during the transactions. In digital transactions, this can happen over the telephone or the internet. Cardholders typically provide the card number, expiry date, and card verification number through telephone or website. With the rise of e-commerce in the past decade, the use of credit cards has increased dramatically [3]. The number of credit card transactions in 2011 in Malaysia were at about 320 million, and increased in 2015 to about 360 million. Along with the rise of credit card usage, the number of fraud cases have been constantly increased. While numerous authorization techniques have been in place, credit card fraud cases have not hindered effectively. Fraudsters favour the internet as their identity and location are hidden. The rise in credit card fraud has a big impact on the financial industry.

Literature Survey

Performing a literature survey on credit card fraud detection using AdaBoost and majority voting involves examining research papers, articles, and conference proceedings that discuss the application of these techniques in the domain of fraud detection. Here's a structured approach to conduct such a survey:

1. *Define Keywords*: Identify keywords related to your topic. These could include "credit card fraud detection", "AdaBoost", "majority voting", "machine learning", "ensemble methods", etc.
2. *Search in Academic Databases*: Utilize academic databases such as Google Scholar, IEEE Xplore, ScienceDirect, ACM Digital Library, and others to search for relevant papers.
3. *Refine Search Queries*: Use combinations of keywords to narrow down your search results. For example:
   - "Credit card fraud detection AdaBoost majority voting"
   - "Ensemble methods for fraud detection"

3 IMPLEMENTATION STUDY

EXISTING SYSTEM:

A credit card fraud detection system was proposed in [8], which consisted of a rule-based filter, Dumpster–Shafer adder, transaction history database, and Bayesian learner. The Dempster–Shafer theory combined various evidential information and created an initial belief, which was used to classify a transaction as normal, suspicious, or abnormal. If a transaction was suspicious, the belief was further evaluated using transaction history from Bayesian learning [8]. Simulation results indicated a 98% true positive rate [8]. A modified Fisher Discriminant function was used for credit card fraud detection in [9]. The modification made the traditional functions to become more sensitive to important instances. A weighted average was utilized to calculate variances, which allowed learning of profitable transactions. The results from the modified function confirm it can eventuate more profit [9].

Disadvantages:

- There is no Majority Voting technique for credit card fraud detection.
- There is no Machine Learning Techniques in the existing system.

Proposed System & alogirtham

In the proposed system, a total of twelve machine learning algorithms are used for detecting credit card fraud. The algorithms range from standard neural networks to deep learning

models. They are evaluated using both benchmark and real world credit card data sets. In addition, the AdaBoost and majority voting methods are applied for forming hybrid models. To further evaluate the robustness and reliability of the models, noise is added to the real-world data set.

4.1 Advantages:

- The system is very fast due to AdaBoost Technique.
- Effective Majority Voting techniques.

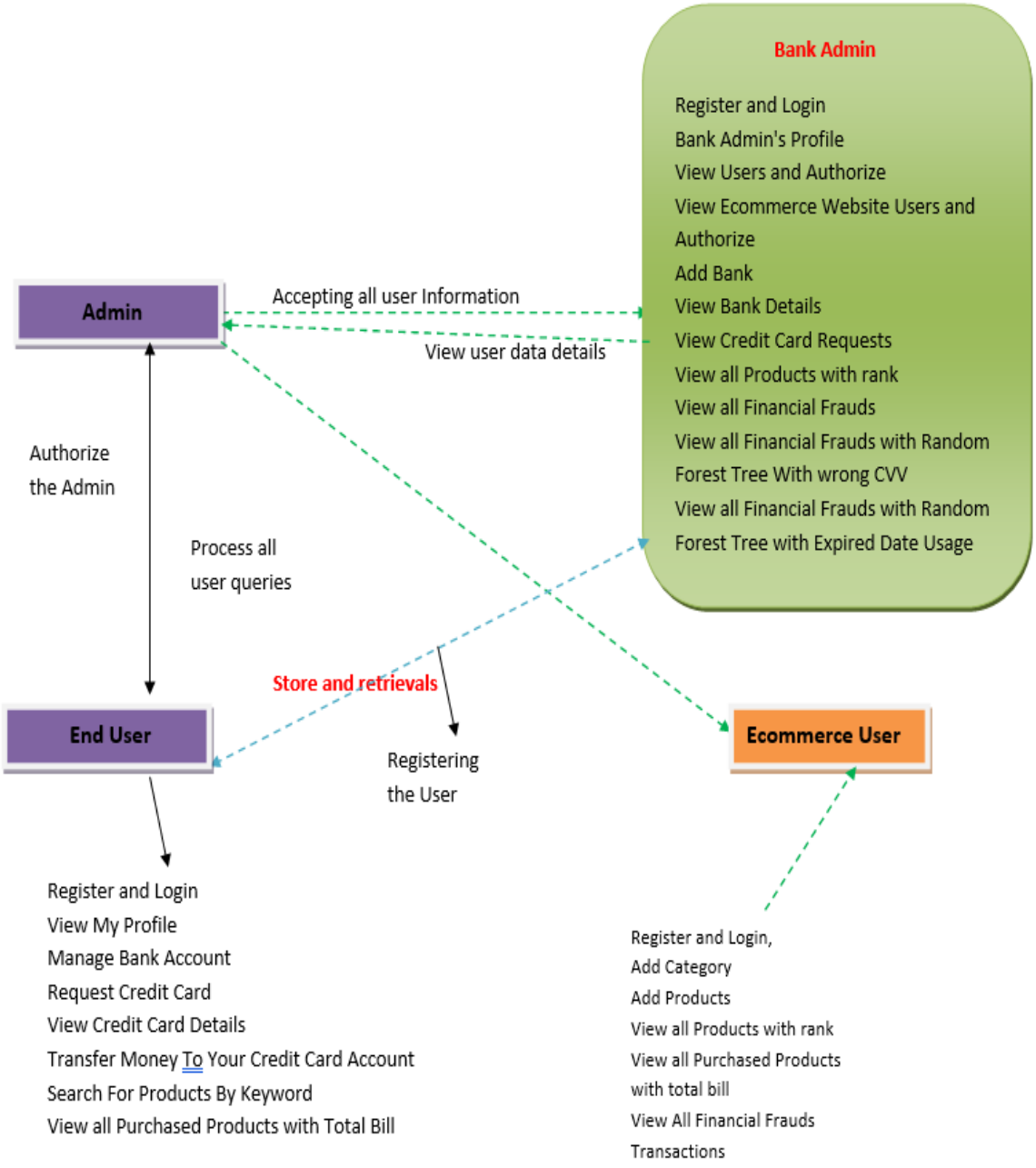


Fig1: System Architecture

IMPLEMENTATION

Modules

Bank Admin

In this module, the admin has to login by using valid user name and password. After login successful he can do some operations such as Bank Admin's Profile ,View Users and Authorize ,View Ecommerce Website Users and Authorize, Add Bank ,View Bank Details ,View Credit Card Requests, View all Products with rank ,View all Financial Frauds ,View all Financial Frauds with Random Forest Tree With wrong CVV ,View all Financial Frauds with Random Forest Tree with Expired Date Usage ,List Of all Users with Majority of Financial

Fraud ,Show Product Rank In Chart ,Show Majority Voting With Wrong CVV Fraud in chart ,Show Majority Voting with Expiry date Usage in chart.

5 RESULTS AND DISCUSSION

The Apache Software Foundation
http://www.apache.org/

Tomcat Web Application Manager

Message:	OK

Manager

List Applications	HTML Manager Help	Manager Help	Server Status

Applications

Path	Display Name	Running	Sessions	Commands
/	Welcome to Tomcat	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/Authenticated Medical Documents Releasing with Privacy Protection and Release Control	SelCSp	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/Credit card fraud detection using AdaBoost and majority voting		true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/docs	Tomcat Documentation	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/examples	Servlet and JSP Examples	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/host-manager	Tomcat Manager Application	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/manager	Tomcat Manager Application	true	1	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes

Deploy

Deploy directory or WAR file located on server

Context Path (required):

SCREENSHORTS

5.3.1 APPLICATION MANAGER

5.1 APPLICATION MANAGER

Deploy

Deploy directory or WAR file located on server

Context Path (required):
XML Configuration file URL:
WAR or Directory URL:
Deploy

WAR file to deploy

Select WAR file to upload Choose file No file chosen
Deploy

Server Information

Tomcat Version	JVM Version	JVM Vendor	OS Name	OS Version	OS Architecture
Apache Tomcat/6.0.20	1.6.0-rc-b104	Sun Microsystems Inc.	Windows Vista	6.2	x86

5.3.2 DISPLAY

5.2 DISPLAY

5.3.3 SIDE BAR MENU

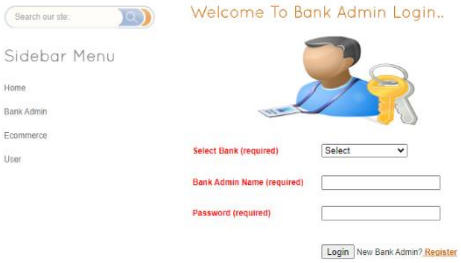
5.3

SIDE BAR MENU

5.3.4 ADMIN MENU

5.4

ADMIN MENU

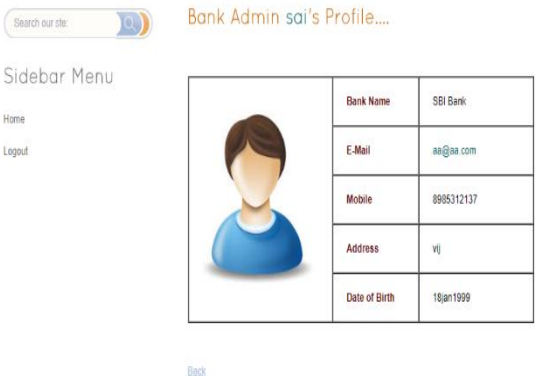


5.3.5 ADMIN LOGIN

5.5 ADMIN LOGIN

5.3.6 ADMIN PROFILE

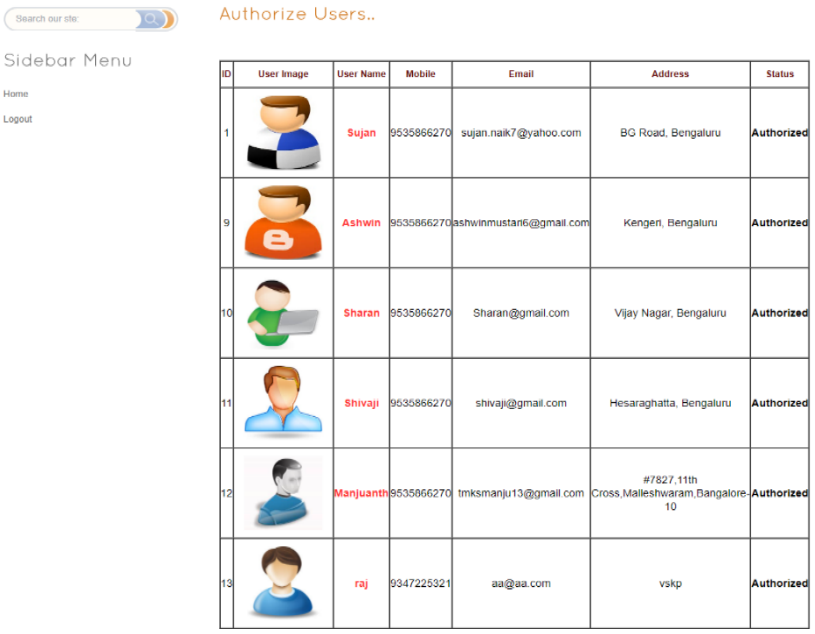
5.6



ADMIN PROFILE

5.3.7 AUTHORIZE USER's

5.7



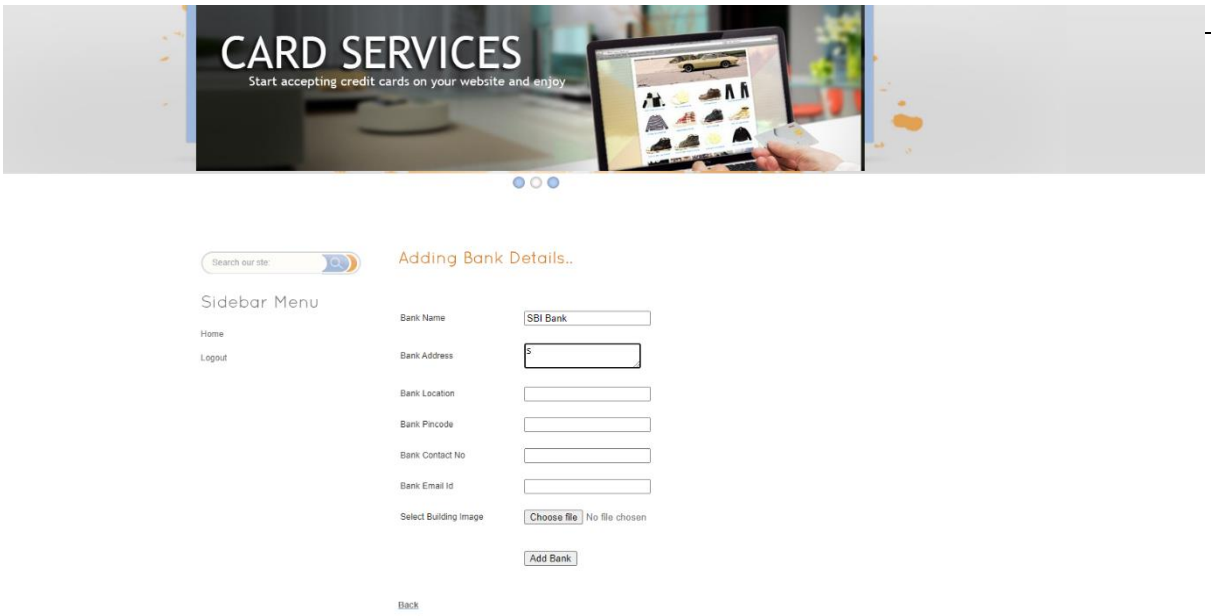
AUTHORIZE USER's

5.3.8 AUTHORIZE ECOMMERCE WEBSITE USER's

5.8

AUTHORIZE ECOMMERCE WEBSITE USER's

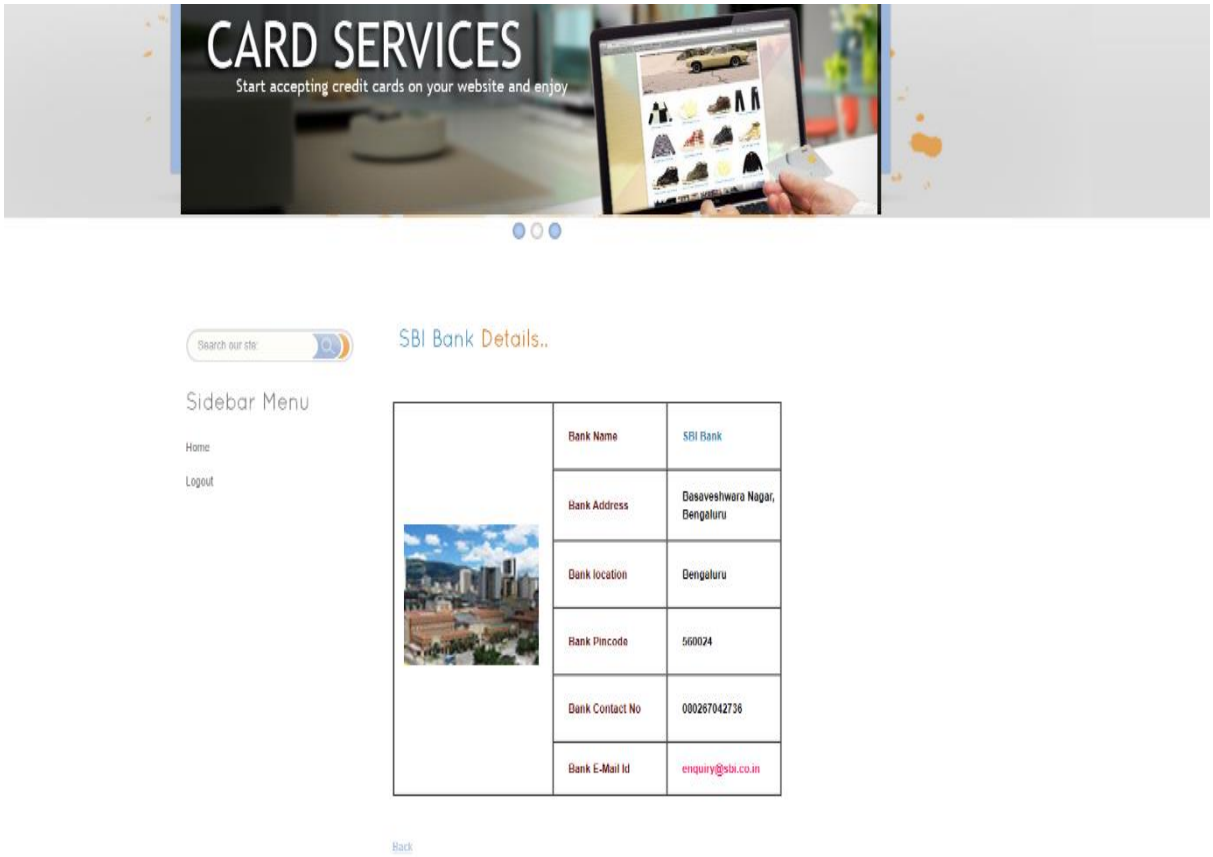
5.3.9 ADDING BANK DETAILS



5.9

ADDING BANK DETAILS

5.3.10 BANK DETAILS



5.10

BANK DETAILS

5.3.11 CREDIT CARD REQUEST FROM BANK USER's

5.11

ID	Account Holder Name	Credit Limit	Cash Limit	Requested Date	Credit Card Number	CRN	CVV	Card Expiry Date
1	Sujan	30000	20000	26/10/2018 11:34:16	646597512025	714943996	4918	26/11/2018
2	Ashwin	15000	5000	01/11/2018 12:37:22	642855074991	713969911	4762	01/12/2018
3	Sharan	10000	5000	01/11/2018 12:40:36	641092121510	710931691	4428	21/10/2018
4	Shivaji	12000	7000	01/11/2018 12:44:55	649942232755	717254223	4176	22/10/2018
5	Manjuanth	40000	10000	01/11/2018 15:01:40	641996865158	711445416	4530	05/11/2018
6	raj	30000	25000	14/06/2024 12:25:40	642938593287	717881568	4992	11/05/2030

CREDIT CARD REQUEST FROM BANK USER's

5.3.12 WEBSITE PRODUCTS

5.12

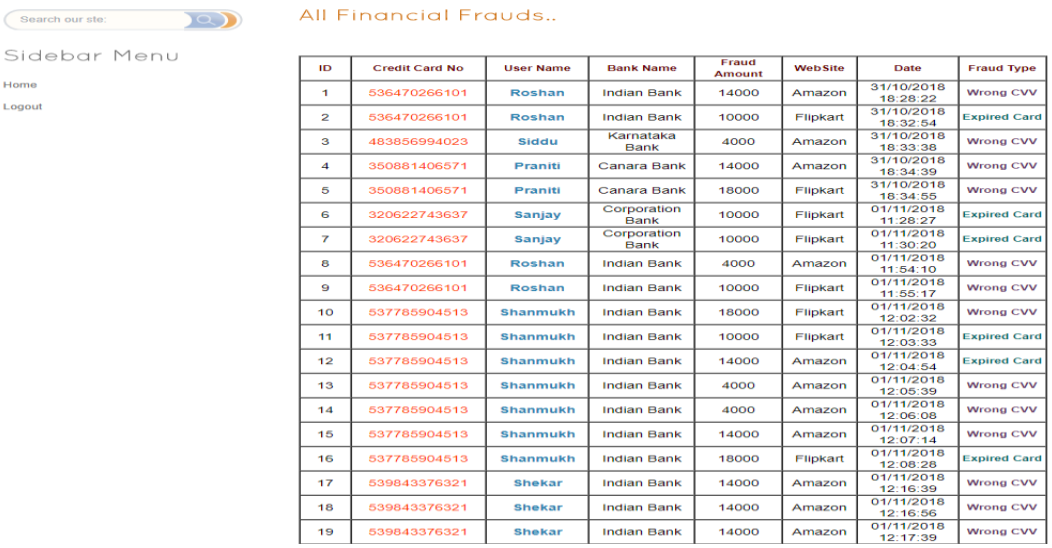
Id	Website	Product Name	Image	Manufacture	Model	Description	Date	Rank	Reviews
1	Flipkart	Mixer Grinder		Bajaj	B101	Bajaj Mixer Grinder B101 Model is a Good quality and a popular grinder in the Market. It has the efficient mechanism to fulfill the customer needs.	24/10/2018 16:48:52	15	Reviews
2	Amazon	Mobile		Samsung	c612	Samsung Mobile model c612 is the best model in basic type. It is a user friendly mobile phone which can be used by anybody.	26/10/2018 14:51:17	14	Reviews
3	Amazon	Smartphone		Red Mi	mi4	Red Mi smartphone is having great features with low price. It is affordable by everyone. It also gives you good service on the product.	26/10/2018 15:51:30	17	Reviews

WEBSITE PRODUCTS

5.3.13 ALL FINANCIAL FRAUDS

5.13

ALL



ID	Credit Card No	User Name	Bank Name	Fraud Amount	WebSite	Date	Fraud Type
1	536470266101	Roshan	Indian Bank	14000	Amazon	31/10/2018 18:28:22	Wrong CVV
2	536470266101	Roshan	Indian Bank	10000	Flipkart	31/10/2018 18:32:54	Expired Card
3	483856994023	Siddu	Karnataka Bank	4000	Amazon	31/10/2018 18:33:38	Wrong CVV
4	350881406571	Praniti	Canara Bank	14000	Amazon	31/10/2018 18:34:39	Wrong CVV
5	350881406571	Praniti	Canara Bank	18000	Flipkart	31/10/2018 18:34:55	Wrong CVV
6	320622743637	Sanjay	Corporation Bank	10000	Flipkart	01/11/2018 11:28:27	Expired Card
7	320622743637	Sanjay	Corporation Bank	10000	Flipkart	01/11/2018 11:30:20	Expired Card
8	536470266101	Roshan	Indian Bank	4000	Amazon	01/11/2018 11:54:10	Wrong CVV
9	536470266101	Roshan	Indian Bank	10000	Flipkart	01/11/2018 11:55:17	Wrong CVV
10	537785904513	Shanmukh	Indian Bank	18000	Flipkart	01/11/2018 12:02:32	Wrong CVV
11	537785904513	Shanmukh	Indian Bank	10000	Flipkart	01/11/2018 12:03:33	Expired Card
12	537785904513	Shanmukh	Indian Bank	14000	Amazon	01/11/2018 12:04:54	Expired Card
13	537785904513	Shanmukh	Indian Bank	4000	Amazon	01/11/2018 12:05:39	Wrong CVV
14	537785904513	Shanmukh	Indian Bank	4000	Amazon	01/11/2018 12:06:08	Wrong CVV
15	537785904513	Shanmukh	Indian Bank	14000	Amazon	01/11/2018 12:07:14	Wrong CVV
16	537785904513	Shanmukh	Indian Bank	18000	Flipkart	01/11/2018 12:08:28	Expired Card
17	539843376321	Shekar	Indian Bank	14000	Amazon	01/11/2018 12:16:39	Wrong CVV
18	539843376321	Shekar	Indian Bank	14000	Amazon	01/11/2018 12:16:56	Wrong CVV
19	539843376321	Shekar	Indian Bank	14000	Amazon	01/11/2018 12:17:39	Wrong CVV

FINANCIAL FRAUDS

5.3.14 WRONG CREDIR CARD CVV

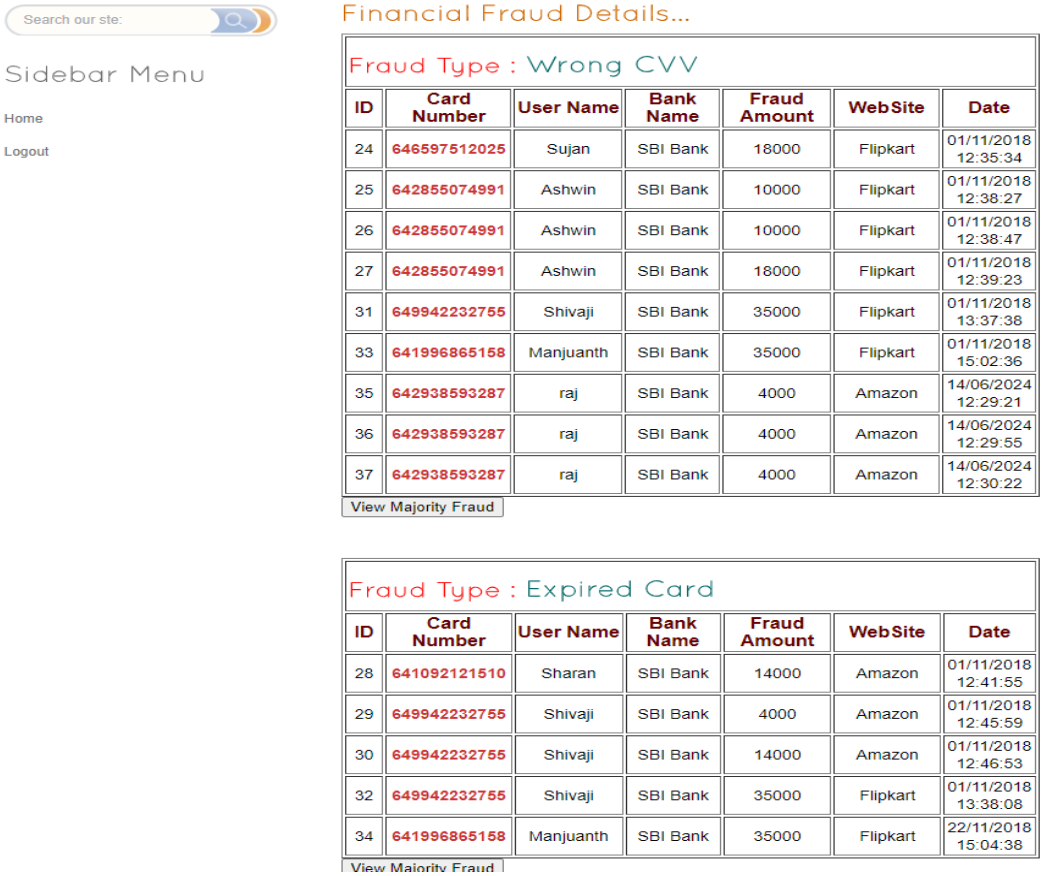
5.14 WRONG CREDIR CARD CVV

5.3.15 FINANCIAL FRAUDS WITH EXPIRED CREDIT CARDS

5.15

FINANCIAL FRAUDS WITH EXPIRED CREDIT CARDS

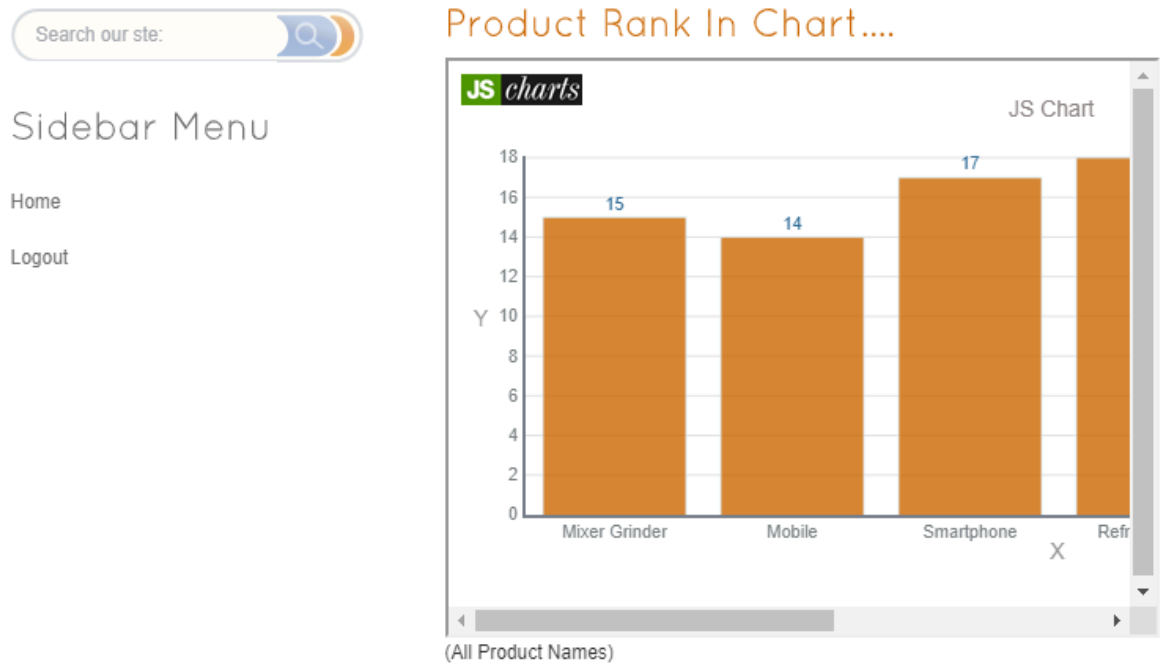
5.3.16 FINANCIAL FRAUD DETAILS



5.16 FINANCIAL FRAUD DETAILS

5.3.17 PRODUCT RANK

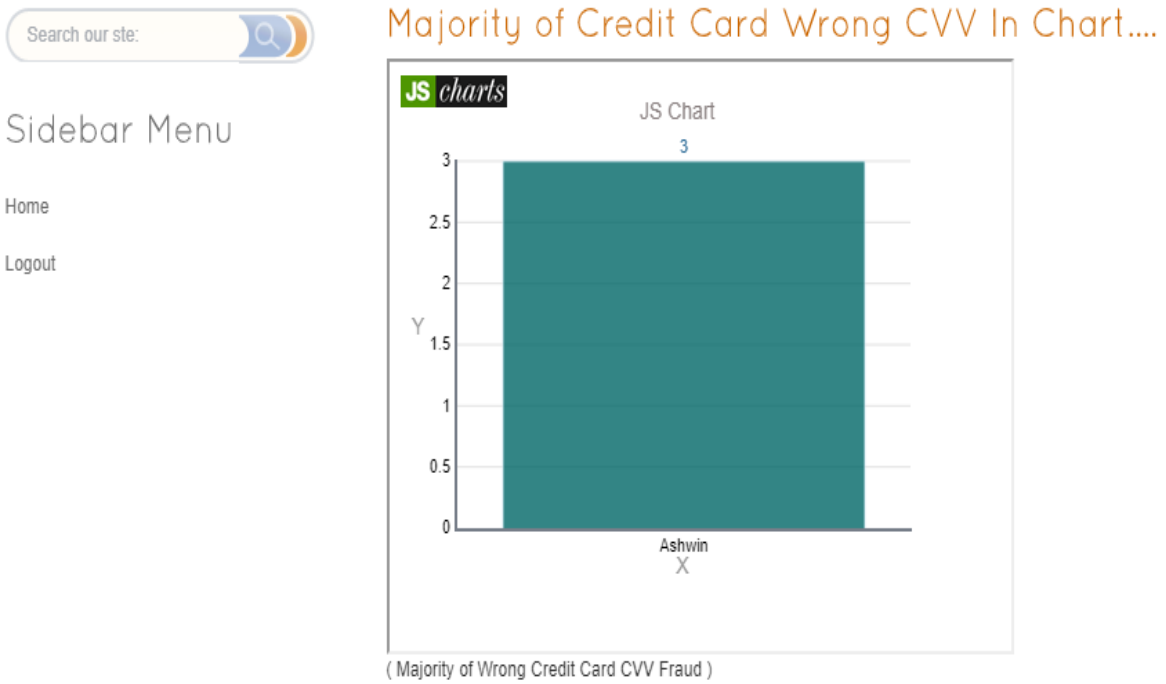
5.17



PRODUCT RANK

5.3.18 MAJORITY OF CREDIT CARD WRONG CVV IN CHART

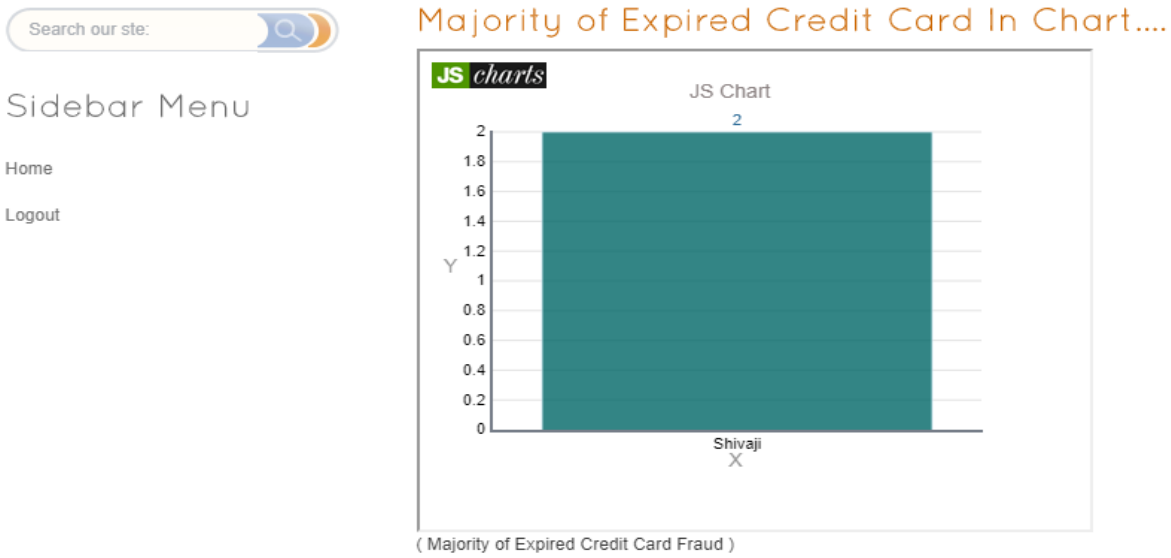
5.18



MAJORITY OF CREDIT CARD WRONG CVV IN CHART

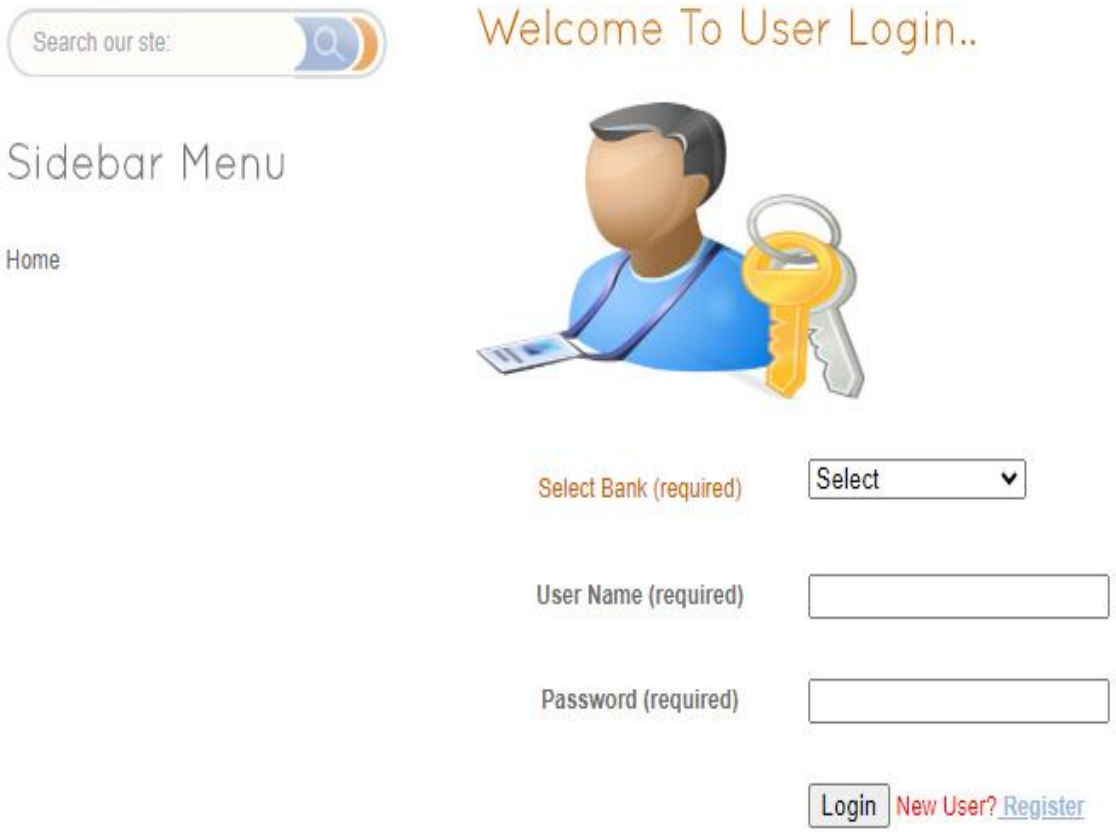
5.3.19 MAJORITY OF EXPIRED CREDIT CARD IN CHART

5.19



MAJORITY OF EXPIRED CREDIT CARD IN CHART

5.3.20 USER LOGIN



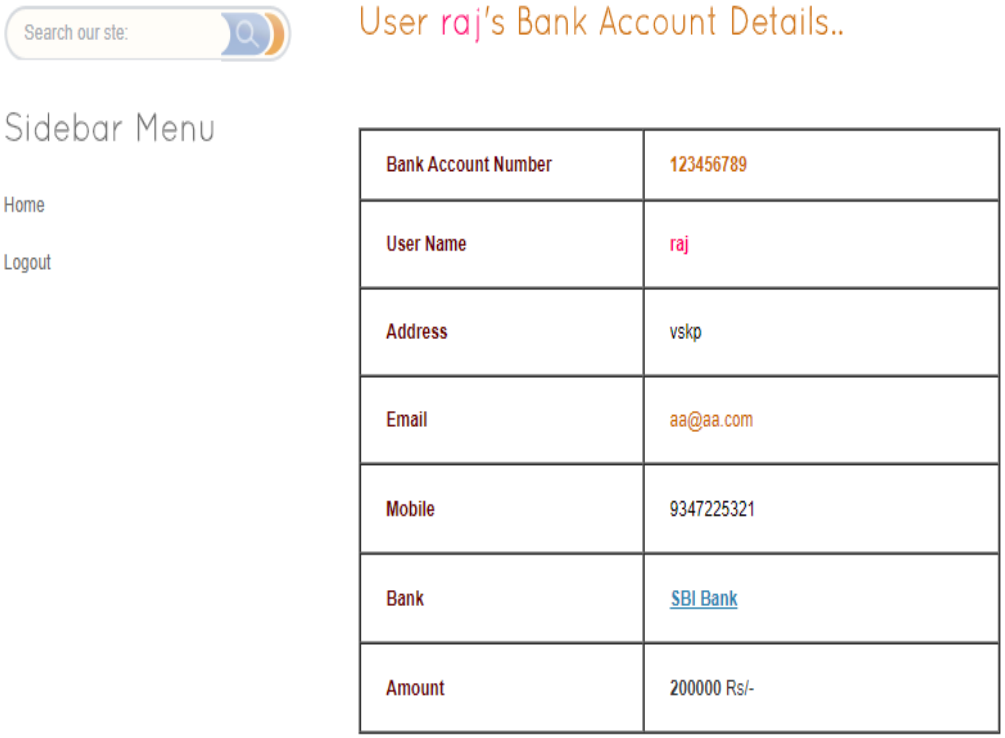
5.3.20 USER

5.3.21 WELCOME USER

5.21

WELCOME USER

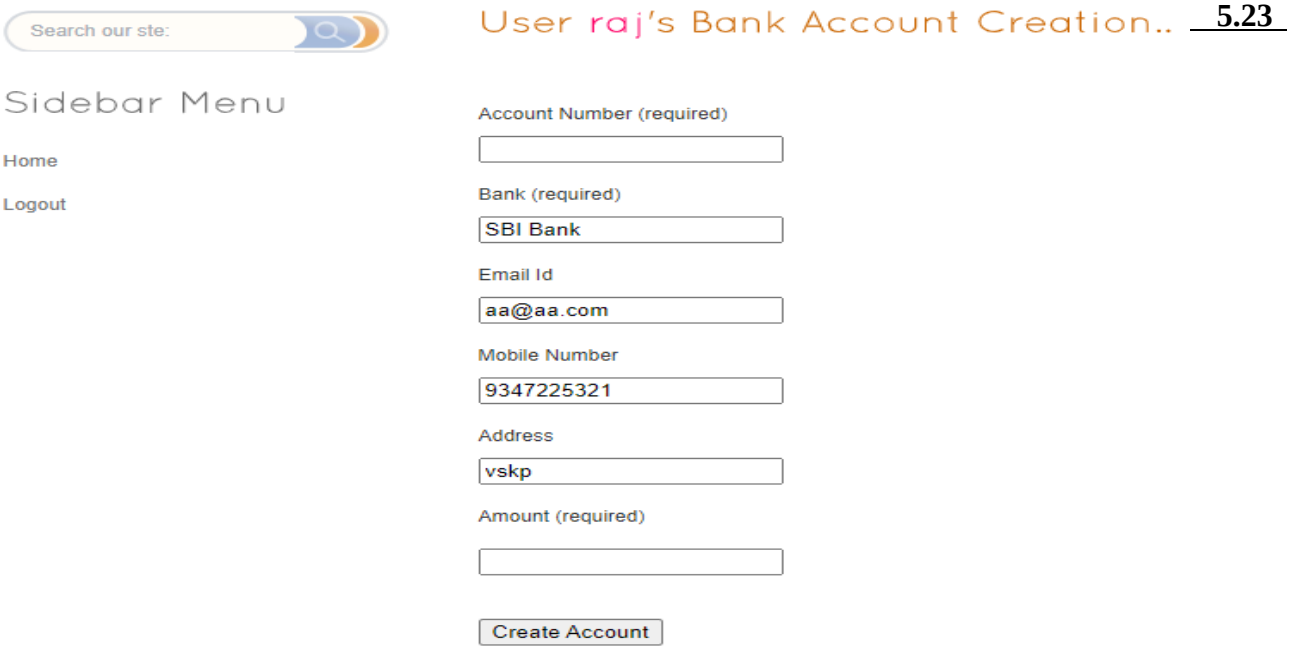
5.3.22 USER BANK DETAILS



5.22 USER BANK DETAILS

5.3.23 BANK ACCOUNT CREATION

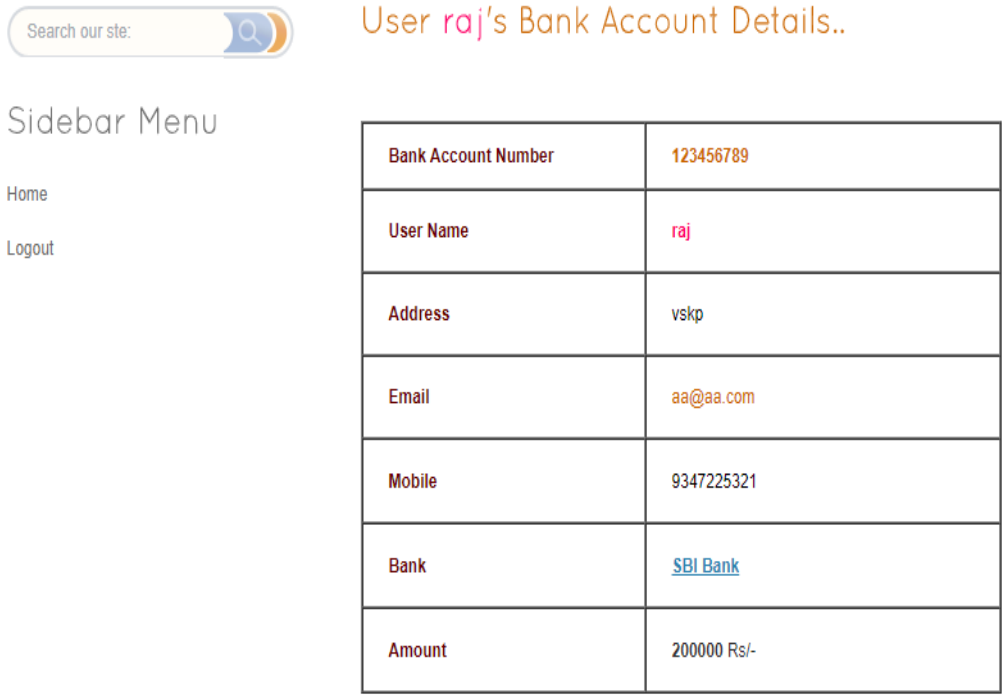
5.23



BANK ACCOUNT CREATION

5.3.24 USER BANK DETAILS

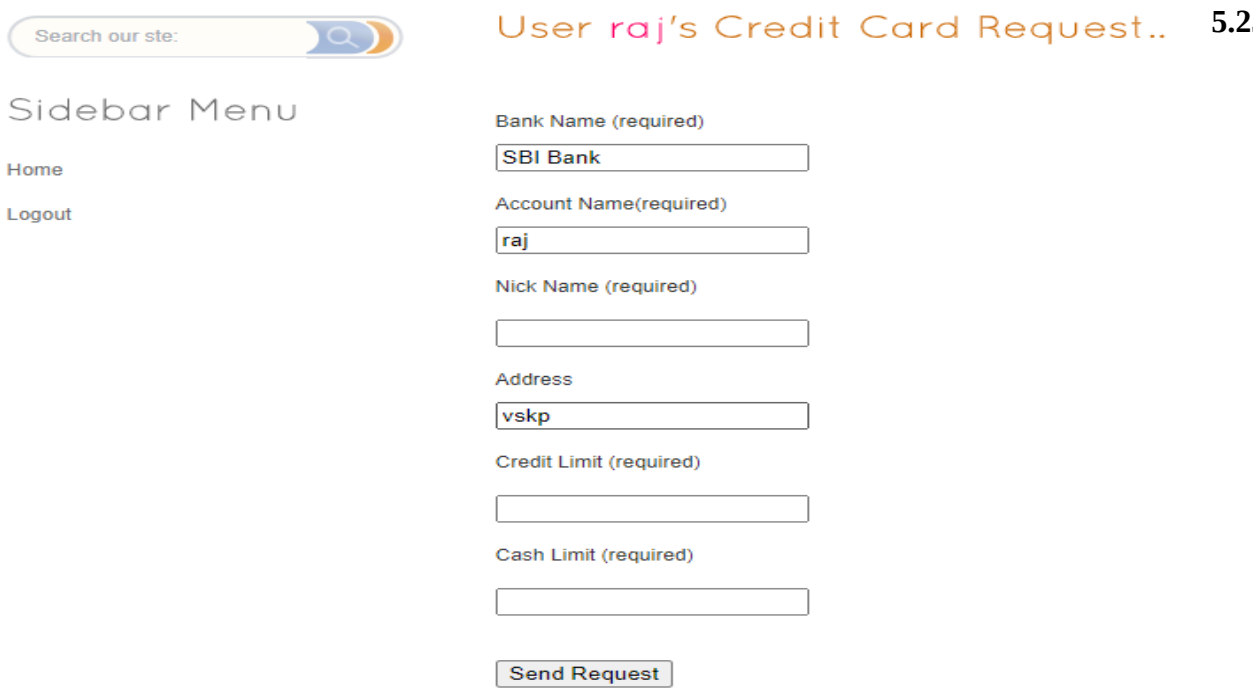
5.24



USER BANK DETAILS

5.3.25 USER CREDIT CARD REQUEST

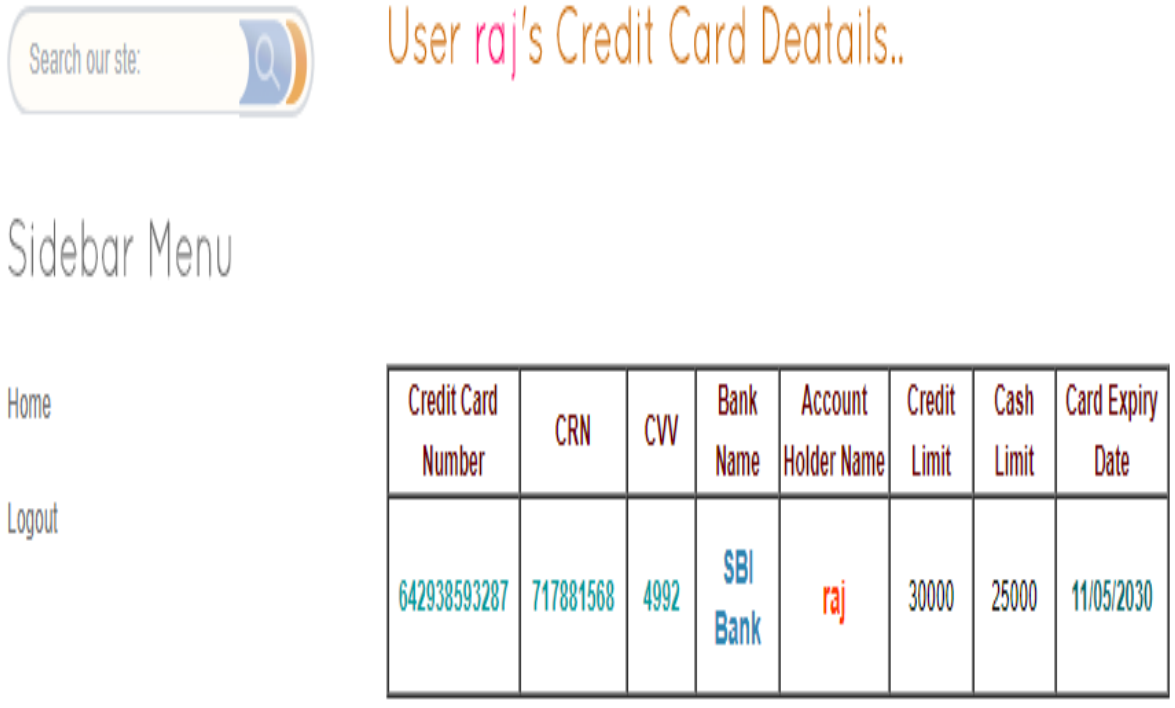
5.25



USER CREDIR CARD REQUEST

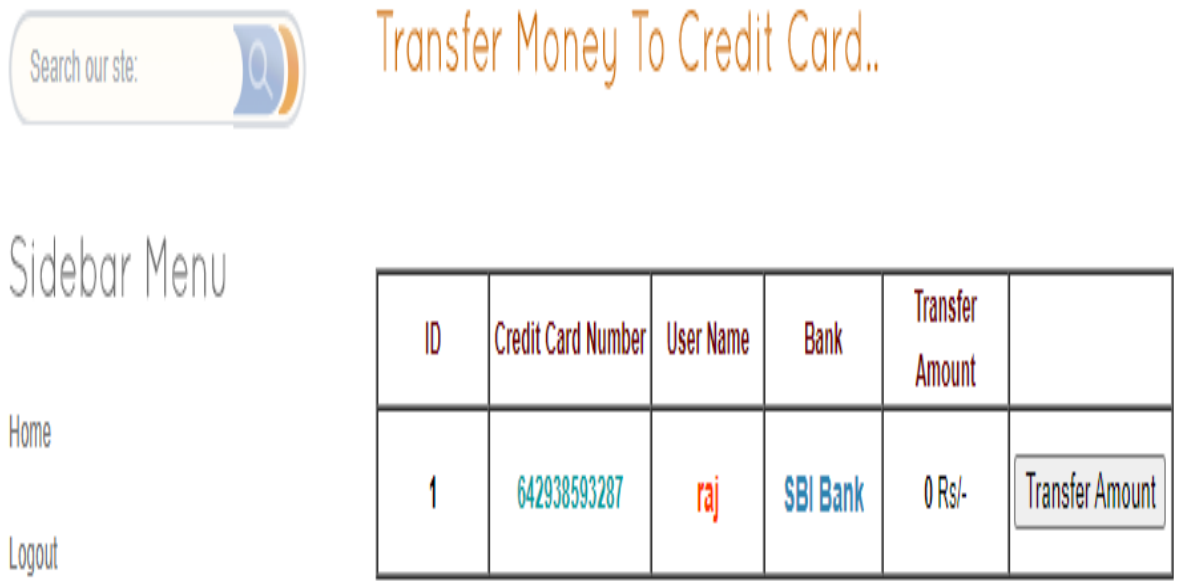
5.3.26 USER CREDIT CARD DETAILS

5.26



USER CREDIT CARD DETAILS

5.3.27 TRANSFER MONEY TO CREDIT CARD



5.27 TRANSFER MONEY TO CREDIT CARD

5.3.28 SEARCH PRODUCT

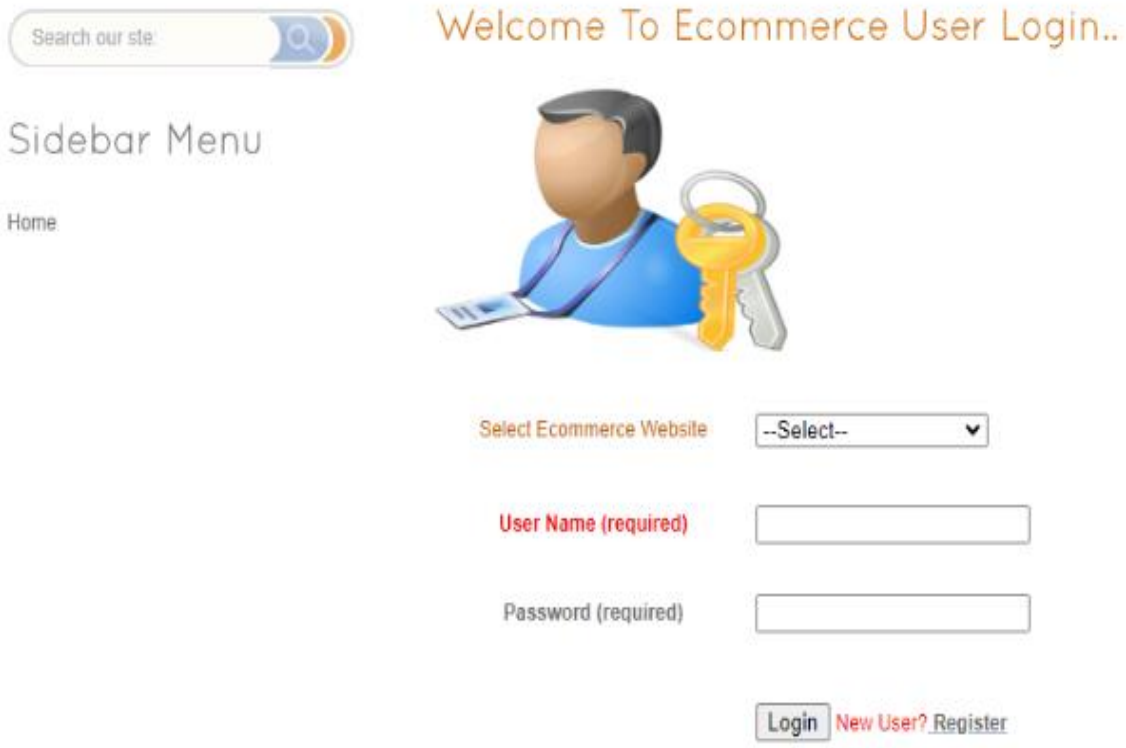
5.28

SEARCH PRODUCT

5.3.29 PURCHASED PRODUCTS

5.29 PURCHASED PRODUCTS

5.3.30 WELCOME TO ECOMMERCE UESR LOGIN



5.30 WELCOME TO ECOMMERCE UESR LOGIN

5.3.31 ECOMMERCE MENU

5.31 ECOMMERCE MENU

5.3.32 ADD CATEGORY

5.32

ADD CATEGORY

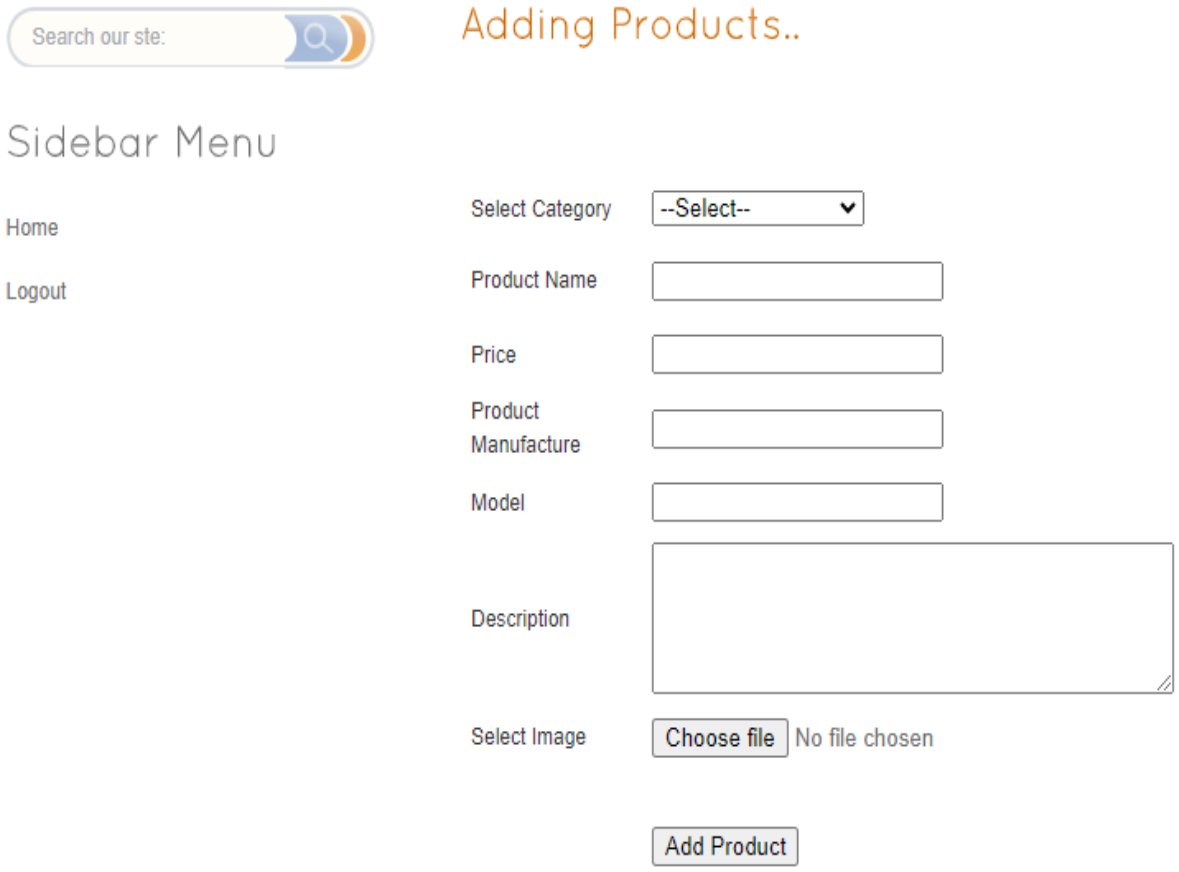
5.3.33 CATEGORY LIST

5.33

CATEGORY LIST

5.3.34 ADDING PRODUCTS

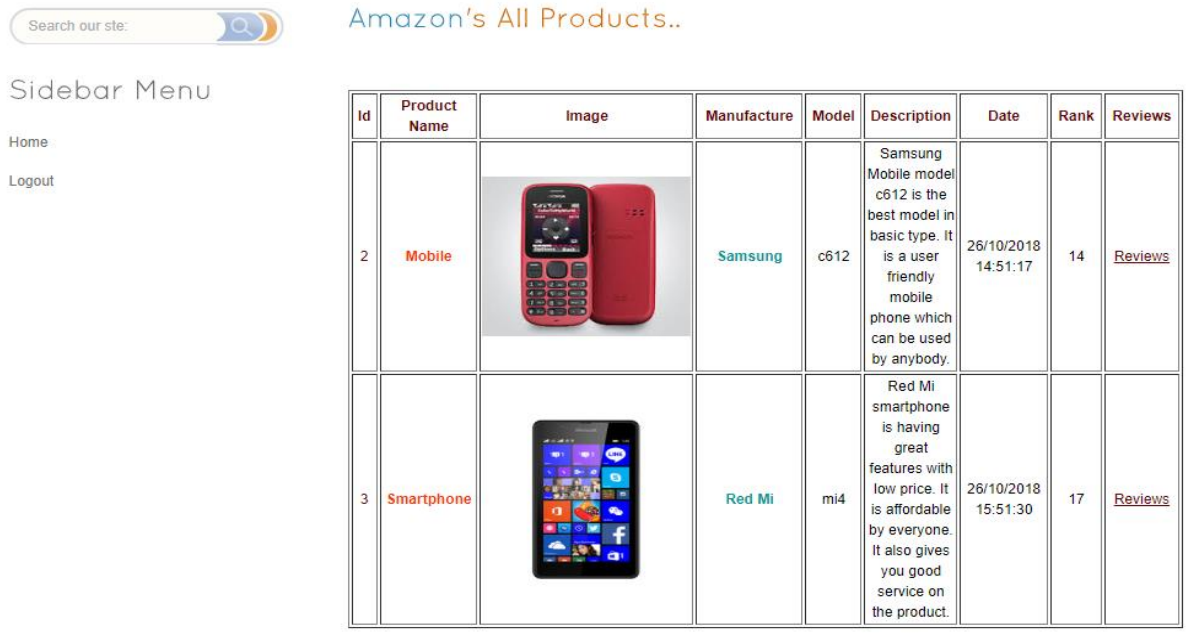
5.34



ADDING PRODUCTS

5.3.35 ALL PRODUCTS

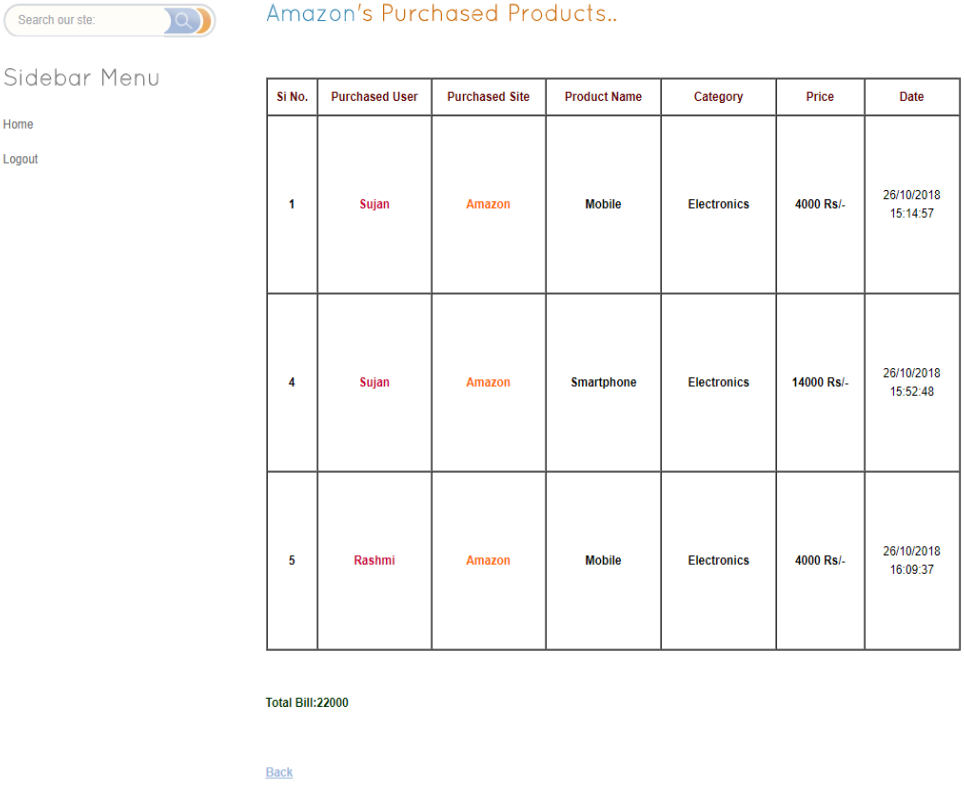
5.35



Id	Product Name	Image	Manufacture	Model	Description	Date	Rank	Reviews
2	Mobile		Samsung	c612	Samsung Mobile model c612 is the best model in basic type. It is a user friendly mobile phone which can be used by anybody.	26/10/2018 14:51:17	14	Reviews
3	Smartphone		Red Mi	mi4	Red Mi smartphone is having great features with low price. It is affordable by everyone. It also gives you good service on the product.	26/10/2018 15:51:30	17	Reviews

ALL PRODUCTS

5.3.36 PURCHASED PRODUCTS



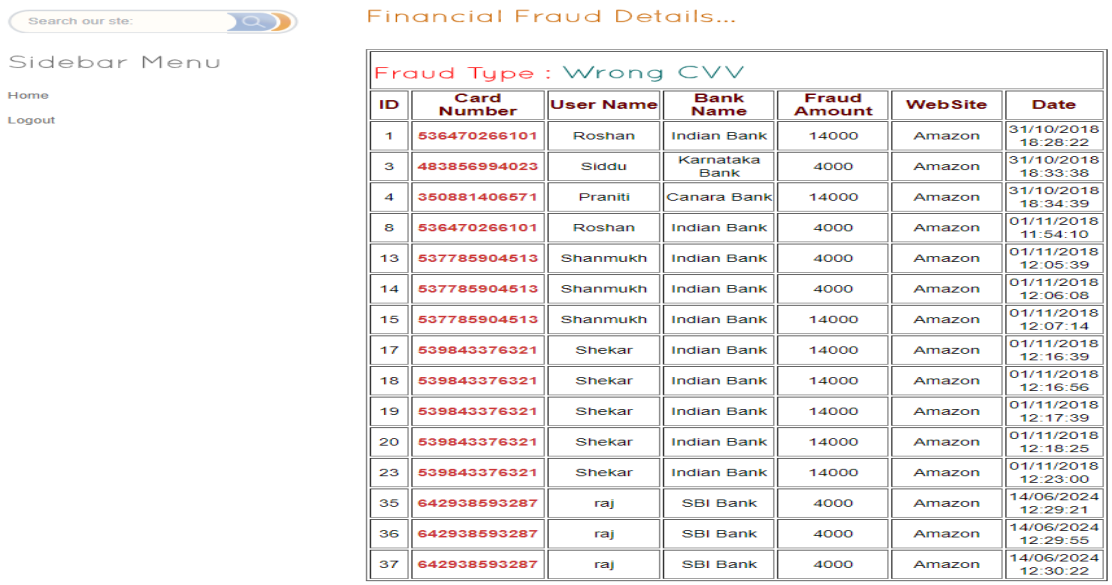
Si No.	Purchased User	Purchased Site	Product Name	Category	Price	Date
1	Sujan	Amazon	Mobile	Electronics	4000 Rs/-	26/10/2018 15:14:57
4	Sujan	Amazon	Smartphone	Electronics	14000 Rs/-	26/10/2018 15:52:48
5	Rashmi	Amazon	Mobile	Electronics	4000 Rs/-	26/10/2018 16:09:37

Total Bill:22000

Back

5.36 PURCHASED PRODUCTS

5.3.37 FINANCIAL FRAUD DETAILS



ID	Card Number	User Name	Bank Name	Fraud Amount	WebSite	Date
1	536470266101	Roshan	Indian Bank	14000	Amazon	31/10/2018 18:28:22
3	483856994023	Siddu	Karnataka Bank	4000	Amazon	31/10/2018 18:33:38
4	350881406571	Praniti	Canara Bank	14000	Amazon	31/10/2018 18:34:39
8	536470266101	Roshan	Indian Bank	4000	Amazon	01/11/2018 11:54:10
13	537785904513	Shanmukh	Indian Bank	4000	Amazon	01/11/2018 12:05:39
14	537785904513	Shanmukh	Indian Bank	4000	Amazon	01/11/2018 12:06:08
15	537785904513	Shanmukh	Indian Bank	14000	Amazon	01/11/2018 12:07:14
17	539843376321	Shekar	Indian Bank	14000	Amazon	01/11/2018 12:16:39
18	539843376321	Shekar	Indian Bank	14000	Amazon	01/11/2018 12:16:56
19	539843376321	Shekar	Indian Bank	14000	Amazon	01/11/2018 12:17:39
20	539843376321	Shekar	Indian Bank	14000	Amazon	01/11/2018 12:18:25
23	539843376321	Shekar	Indian Bank	14000	Amazon	01/11/2018 12:23:00
35	642938593287	raj	SBI Bank	4000	Amazon	14/06/2024 12:29:21
36	642938593287	raj	SBI Bank	4000	Amazon	14/06/2024 12:29:55
37	642938593287	raj	SBI Bank	4000	Amazon	14/06/2024 12:30:22

5.37

FINANCIAL FRAUD DETAILS

5.3.38 EXPIRED CARD

Fraud Type : Expired Card

ID	Card Number	User Name	Bank Name	Fraud Amount	WebSite	Date
12	537785904513	Shanmukh	Indian Bank	14000	Amazon	01/11/2018 12:04:54
28	641092121510	Sharan	SBI Bank	14000	Amazon	01/11/2018 12:41:55
29	649942232755	Shivaji	SBI Bank	4000	Amazon	01/11/2018 12:45:59
30	649942232755	Shivaji	SBI Bank	14000	Amazon	01/11/2018 12:46:53

Show in Chart

5.38

EXPIRED CARD

6. CONCLUSION AND FUTURE WORK

CONCLUSION

A study on credit card fraud detection using machine learning algorithms has been presented in this paper. A number of standard models which include NB, SVM, and DL have been used in the empirical evaluation. A publicly available credit card data set has been used for evaluation using individual (standard) models and hybrid models using AdaBoost and majority voting combination methods. The MCC metric has been adopted as a performance measure, as it takes into account the true and false positive and negative predicted outcomes. The best MCC score is 0.823, achieved using majority voting. A real credit card data set from a financial institution has also been used for evaluation. The same individual and hybrid models have been employed. A perfect MCC score of 1 has been achieved using AdaBoost and majority voting methods. To further evaluate the hybrid models, noise from 10% to 30% has been added into the data samples. The majority voting method has yielded the best MCC score of 0.942 for 30% noise added to the data set. This shows that the majority voting method is stable in performance in the presence of noise. For future work, the methods studied in this paper will be extended to online learning models. In addition, other online learning models will be investigated. The use of online learning will enable rapid detection of fraud cases, potentially in real-time. This in turn will help detect and prevent fraudulent transactions before they take place, which will reduce the number of losses incurred every day in the financial sector.

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