

Improved Credit Card Fraud Detection using Machine Learning

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Abstract:- Credit card fraud events take place frequently and then result in huge financial losses. The number of online transactions has grown in large quantities and online credit card transactions hold a huge share of these transactions. As credit card becomes the most popular mode of payment for both online as well as regular purchase, cases of fraud associated with it are also rising. The most commonly used fraud detection methods are Neural Network (NN), rule-induction techniques, fuzzy system, decision trees, Support Vector Machines (SVM), Artificial Immune System (AIS), genetic algorithms, K- Nearest Neighbor algorithms.

Keywords— Data mining, Fuzzy logic, Machine learning, NN, SVM, AIS, K-Nearest Neighbor Algorithm

I. INTRODUCTION

Credit cards are the plastic cards issued by financial companies and institutions such as banks. The payment card allows the cardholder to repeatedly borrow funds to buy products, food, merchandises or services. Here the card user agrees to pay the amount back within the due date. It is a lot easier to carry payment cards over cash while on the move. We can even perform online payments using credit cards. In such type of transaction, the card holder has to enter few details (card number and expiry date) and make his/her purchase online. This ease of use has made credit cards more popular nowadays. The growing popularity of e-commerce in a way has led to the increase in credit card users and cashless payments. If we consider the growth of credit cards in India In May 2015 , 21480389 were the number of credit cards issued and 570813794 debit cards were issued. In the year 2016, online spending value increased rapidly than that of offline payments i.e., increase in percentage was 26%(online) and 17%(offline).

A. Advantages

1. It is a lot easier to carry payment cards over cash while on the move.
2. The growing popularity of e-commerce
3. A clear understanding on all these approaches will certainly lead to an efficient credit card fraud detection system.

4. It should identify the frauds accurately
5. It should detecting the frauds quickly

B. Credit Card Fraud Variants

1) ID theft: When an attacker obtains the personal information of a victim such as date of birth, gender, email id, he can easily get access to a new account using victim's details or even a step further by taking hold of the existing account. Identity theft constitutes 71% of the most common type of fraud.

2) Fake cards: Card which is not authorized or not issued by financial institutions is termed as fake cards. Fake cards are developed by skimming the actual data of genuine card which was swiped over an EDC machine. This data is encoded from the magnetic strips and later used to create fake cards.

3) Stolen/lost cards: A scenario where a card holder accidentally loses his card or his card has been stolen, if the cardholder fails to report it to the concerned bank there might be chances that the card can be misused by a criminal.

4) CNP fraud: Card, not present fraud is a type of fraud where the criminal requires minimal information such as card number and expiry date. In such situation, the card need not be present while making the purchases online.

5) Clean fraud: Frauds are not as clean as they sound. The purchases are made with stolen cards and later transactions are modified thus making it find a way around the FDS.

6) Friendly fraud: In friendly fraud the actual cardholder himself makes the purchases and pays for the services using "pull" mode of payment with his credit/debit card. Later reports a complaint stating loss of card and claims for reimbursement.

7) Affiliate fraud: It is the most widely distributed fraud where either an individual logs into a website and makes purchases using a false account or a program is designed to carry out fraud activities.

8) Triangle fraud: Such fraud mainly involves 3 steps: (a) Creating a fake website (b) Providing offers such as immediate delivery upon credit card payment

mode (c) Stolen or fake cards are used to make the payments and the name obtained at the real store is misused by the criminal to later ship the product to the customer.

II. *Related Works*

A. Rajeshwari U, B Sathish Babu

With the growing popularity of the internet, everything is available at our doorstep and convenience. The rapid increase in e-commerce applications has resulted in the increased usage of the credit card for offline and online payments. Though there are various benefits of using credit cards such as convenience, instant cash, but when it comes to security credit card holders, banks, and the merchants are affected when the card is being stolen, lost or misused without the knowledge of the cardholder (Fraud activity). Streaming analytics is a time-based processing of data and it is used to enable near real-time decision making by inspecting, correlating and analyzing the data even as it is streaming into applications and database from myriad different sources. We are making use of streaming analytics to detect and prevent the credit card fraud. Rather than singling out specific transactions, our solution analyses the historical transaction data to model a system that can detect fraudulent patterns. This model is then used to analyze transactions in real-time.

1. Though there are various benefits of using credit cards such as convenience
2. Instant cash, but when it comes to security credit card holders, banks

B. Heta Naik , Prashasti Kanikar

Now day's online transactions have become an important and necessary part of our lives. As frequency of transactions is increasing, number of fraudulent transactions are also increasing rapidly. In order to reduce fraudulent transactions, machine learning algorithms like Naïve Bayes, Logistic regression, J48 and AdaBoost etc. Are discussed in this paper. The same set of algorithms are implemented and tested using an online dataset. Through comparative analysis it can be concluded that Logistic regression and AdaBoost algorithms perform better in fraud detection.

1. As frequency of transactions is increasing, number of fraudulent transactions is also increasing rapidly.
2. The same set of algorithms are implemented and tested using an online dataset.

C. S. Benson Edwin Raj, 2A. Annie Portia

Due to the rise and rapid growth of E-Commerce, use of credit cards for online purchases has dramatically increased and it caused an explosion in the credit card fraud. As credit card becomes the most popular mode of payment for both online as well as regular purchase, cases of fraud associated with it are also rising. In real life, fraudulent transactions are scattered with genuine transactions and simple pattern matching

techniques are not often sufficient to detect those frauds accurately. Implementation of efficient fraud detection systems has thus become imperative for all credit card issuing banks to minimize their losses. Many modern techniques based on Artificial Intelligence, Data mining, Fuzzy logic, Machine learning, Sequence Alignment, Genetic Programming etc., has evolved in detecting various credit card fraudulent transactions. A clear understanding on all these approaches will certainly lead to an efficient credit card fraud detection system. This paper presents a survey of various techniques used in credit card fraud detection mechanisms and evaluates each methodology based on certain design criteria.

1. Credit cards for online purchases has dramatically increased and it caused an explosion in the credit card fraud
2. Has evolved in detecting various credit card fraudulent transactions.

D. Masoumeh Zareapoor, Seeja.K.R

Financial fraud is increasing significantly with the development of modern technology and the global superhighways of communication, resulting in the loss of billions of dollars worldwide each year. The companies and financial institution loose huge amounts due to fraud and fraudsters continuously try to find new rules and tactics to commit illegal actions. Thus, fraud detection systems have become essential for all credit card issuing banks to minimize their losses. The most commonly used fraud detection methods are Neural Network (NN), rule-induction techniques, fuzzy system, decision trees, Support Vector Machines (SVM), Artificial Immune System (AIS), genetic algorithms, K-Nearest Neighbor algorithms. These techniques can be used alone or in collaboration using ensemble or meta-learning techniques to build classifiers. This paper presents a survey of various techniques used in credit card fraud detection and evaluates each methodology based on certain design criteria.

1. The companies and financial institution loose huge amounts due to fraud and fraudsters continuously try to find new rules and tactics to commit illegal actions.
2. These techniques can be used alone or in collaboration using ensemble or meta-learning techniques to build classifiers.

III. MODULE DESCRIPTION

- A. Data description
- B. Credit Card Fraud Detection Using Bayesian and Neural Networks
- C. Credit card fraud Detection
- D. Modeling and testing
- E. Fraud Detection Systems

A. *Data description*

The dataset was created combining two data sources; the fraud transactions log file and all transactions

log file. The fraud transactions log file holds all the online credit card fraud occurrences while all transactions log file holds all transactions stored by the corresponding bank within a specified time period. Due to the confidential disclosure agreement made between the bank and the authors of the paper, some of the sensitive attributes such as card number were hashed.

B. Credit Card Fraud Detection Using Bayesian and Neural Networks

The credit card fraud detection using Bayesian and Neural Networks are automatic credit card fraud detection system by means of machine learning approach. These two machine learning approaches are appropriate for reasoning under uncertainty. An artificial neural network consists of an interconnected group of artificial neurons and the commonly used neural networks for pattern classification is the feed- forward network. It consist of three layers namely input, hidden and output layers. The incoming sequence of transactions passes from input layer through hidden layer to the output layer. This is known as forward propagation.

C. Credit card fraud Detection

Illegal use of credit card or its information without the knowledge of the owner is referred to as credit card fraud. Different credit card fraud tricks belong mainly to two groups of application and behavioral fraud [3]. Application fraud takes place when, fraudsters apply new cards from bank or issuing companies using false or other’s information. Multiple applications may be submitted by one user with one set of user details (called duplication fraud) or different user with identical details (called identity fraud). Fraud detection systems are prone to several difficulties and challenges enumerated bellow. The system should take into account both the cost of fraudulent behavior that is detected and the cost of preventing it.

D. Modeling and testing

They are Support Vector Machine, Naive Bayes, K- Nearest Neighbor and Logistic Regression. We applied those selected supervised learning classifiers to our resample data. When selecting machine learning models which can capture each fraud, the accuracy and performance of each model were taken into consideration. Optimal models were selected by filtering them out comparatively against an appropriate performance matrix.

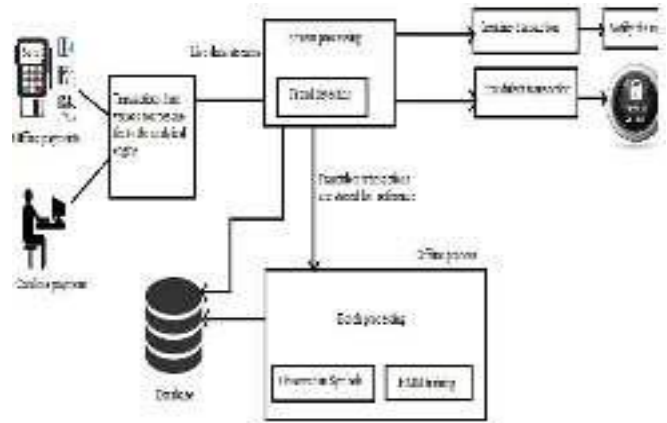
E. Fraud Detection Systems

Real-time detection of credit card fraud can be stated as one of the main contributions of this project. The real-time fraud detection system consists of three main units; API MODULE, FRAUD DETECTION MODELS. All the components are involved in fraud detection simultaneously. The predicted results and other important data of the machine learning models. The user can interact with the fraud detection system with GUIs

where it shows the real time transactions, alerts regarding frauds and historical data regarding frauds in a graphical representation.

IV. SYSTEM ARCHITECTURE

Conclusion



Credit card fraud detection has been a keen area of research for the researchers for years and will be an intriguing area of research in the coming future. This happens majorly due to continuous change of patterns in frauds. In this paper, we propose a novel credit-card fraud detection system by detecting four different patterns of fraudulent transactions using best suiting algorithms and by addressing the related problems identified by past researchers in credit card fraud detection. By addressing real time credit-card fraud detection by using predictive analytics and an API module the end user is notified over the GUI the second a fraudulent transaction is taken place. This part of our system can allow the fraud investigation team to make their decision to move to the next step as soon as a suspicious transaction is detected.

V. FUTURE ENHANCEMENTS

Optimal algorithms that address four main types of frauds were selected through literature, experimenting and parameter tuning as shown in the methodology. As the developed machine learning models present an average level of accuracy, we hope to focus on improving the prediction levels to acquire a better prediction. Also, the future extensions aim to focus on location-based frauds.

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