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Credit Card Fraud Detection System Using CNN

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Abstract: *This Project is focused on credit card fraud detection in real-world scenarios. Fraud is one of the major ethical issues in the credit card industry. In this era we can see many innovative financial services like ATMs, online banking, etc. Besides, along with the rapid advances of e-commerce, the use of credit cards has become a convenient and necessary part of financial life. A credit card is a payment card supplied to customers as a system of payment. Using a third-person credit card or its information without the knowledge of that person is referred to as credit card fraud. Application and Behavioral fraud are major types of fraud where people are easily tricked and lose their money. The same user may submit multiple applications which may lead to identical fraud. Application fraud takes place when fraudsters apply for new cards from a bank or issuing companies using false or others' information. In this project, we will be applying some supervised and unsupervised algorithms and will classify the credit card dataset. We will use CNN and correlate the data train and get the model's accuracy.*

Keywords: CCFD, CNN, Logistic Regression, Feature extraction.

I. INTRODUCTION

The main aim of the project is to create a fraud detection system. Our vision is to create a detection system that detects fraudulent transactions to help people and create awareness about this deceit.

In this current period, purchasing items from e-commerce sites has become common. Many companies developed an online transaction mode for payment via credit cards to identify the different types of credit card fraud happening and to review alternative techniques used in fraud detection. We are going to apply machine learning algorithms to past data and predict the possibility of a transaction being a fraud transaction. Purchasing items from e-commerce sites and paying via credit card has become common. To solve this problem, we will be using some machine learning methods like CNN the dataset will be divided into a training set and test set. The algorithms used in the experiment are Logistic Regression and CNN. To detect fraud in a transaction we need to perform and use complex algorithms and functions. In this project, we will try to train our dataset to get max accuracy to detect fraud transactions. Credit card fraud is mainly divided into two forms: and talks to them. To shape our thoughts into an application, we created a personal assistant with emotion recognition.

- 1) *Non-Internet-based Fraud:* It happens without permission n of the actual card owner. In most cases, the card-issuing can lock it previously it's used in a fraudulent procedure.
- 2) *Internet-based Fraud:* It happens through the web just hacker traces the card details and login details, and he/she can access the account and transact money. In this project, we will be designing a model to detect fraudulent activity in credit card transactions. Our model is trained to provide the essential features required to detect fraudulent transactions and we will be using machine learning algorithms to automate this process and to detect fraud transactions. The statistics alternatively focus on data inference and probability, ML contains further issues about the efficiency and feasibility of data processing algorithms and architectures, compounding several learning tasks with one compactor performance measure.

II. LITERATURE REVIEW

The literature survey includes all the research done by various researchers on the respective topic. After a lot of contemplation on the core idea of our project, its pros and cons, and the probability of completing the project successfully, To increase our knowledge on the topic we started our work by doing a lot of study on the projects and research papers that are similar to our core idea and project.

These research papers and surveys enabled us to understand what is necessary for us to venture into a project of this sort.

Author	Topic	Remarks
A. Thennakoon, C. Bhagyan, S. Premadasa, S. Mihiranga and N. Kuruwitaarachchi	A paper based four main fraud occasions in real-world transactions	Focused on better prediction level and an API module to decide if a particular transaction is genuine.
Sapna Sahu, Shikha Agarwal, Raju Baraskar.	Comparing various ML algorithms	Clustering and CNN perform well in unsupervised and supervised learning algorithm respectively
Aayushi Agarwal, Baldivya, Mitra, Md Iqbal	A Survey of various techniques used for CCFD	Random forest and K-NN can be the best techniques to get better accuracy

Using these research papers, we understood how and which algorithm can be more exact. Also, we used and surveyed a lot of fraud detection programs and algorithms to detect fraudulent transaction. We got inspired by a lot of ideas that arose after reading below mentioned papers. There are numerous fraud detection methods but we can't rely on or state one specific algorithm method that distinguishes the fraud totally [5].

III. PROPOSED METHOD

We propose a Machine learning model to detect fraudulent credit card activities in online financial transactions. Analyzing fake transactions manually is impracticable due to the vast amounts of data and its complexity. To classify fraudulent and legitimate credit card transactions by using supervised and unsupervised algorithms. To help us in getting awareness about the fraudulent activities without any financial loss. In our project we will be getting raw data and then performing data cleaning and transformation then we will be performing feature correlation and feature selection and applying ML algorithms like Logistic regression and predicting accuracy

A. Model Architecture

After importing the dataset and analyzing the dataset and performing data exploration and statistical analysis we further balance the data and separate the dataset to test and train and build a CNN model. So after importing the dataset, we have performed cleaning and then we have split the dataset into fraud and non-fraud data and created a balance data for checking fraud transactions, and plotted a bar graph to analyze the frequency of fraudulent transaction.

B. Machine Learning Algorithm Used

Convolutional neural network (CNN) –It is a neural network that has one or more convolutional layers used for classifying and segmenting images processing other correlated-data.

Logistic Regression is a classification algorithm i.e. used to predict the probability of a categorical dependent variable

Prediction- if we want a machine to make predictions for us, we should train it with some data.

Decision tree classification-

Statistical techniques: average, quantiles, probability distribution, association rules e data.

Supervised ML algorithm used: Logistic regression.

C. Algorithm

- 1) Step 1: Dataset is imported
- 2) Step 2: The imported dataset is read
- 3) Step 3: For balancing the dataset Random Sampling is done
- 4) Step 4: The dataset is divided into two parts, i.e., the Train dataset and Test dataset.
- 5) Step 5: Feature selection is applied for the proposed models.
- 6) Step 6: Accuracy and performance metrics are calculated to know the efficiency of the algorithm.
- 7) Step7: We build a Convolutional Neural Network
- 8) Step8: We predict from the test dataset.
- 9) Step 9: Perform logistic regression to find accuracy precision and recall value
- 10) Step 10: Then will predict the loss and accuracy and create a confusion matrix for our model

Algorithm for credit card fraud detection using CNN

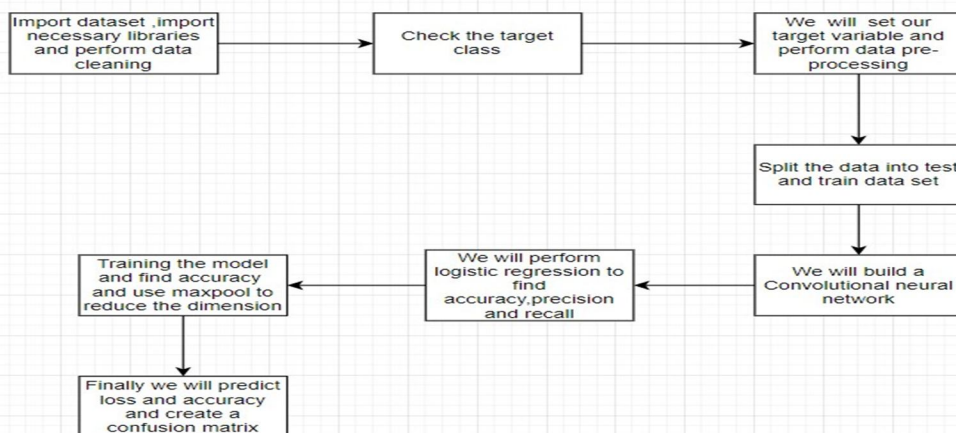


Fig 1. Algorithm For CCFD

D. Methodology

We will be using classical ML methods and training our dataset and performing oversampling to reduce the imbalance data also we will be using CNN and after balancing the data and attain precise accuracy.

The following are the modules of the project, which are planned aid to in completing the project concerning the proposed system while overcoming the existing system and providing support for enhancing in future.

- 1) Data Collection
- 2) Data Pre-processing
- 3) Feature Extraction
- 4) Evaluation model

```

data.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 284807 entries, 0 to 284806
Data columns (total 31 columns):
#   Column      Non-Null Count  Dtype
---  -
0   Time        284807 non-null float64
1   V1          284807 non-null float64
2   V2          284807 non-null float64
3   V3          284807 non-null float64
4   V4          284807 non-null float64
5   V5          284807 non-null float64
6   V6          284807 non-null float64
7   V7          284807 non-null float64
8   V8          284807 non-null float64
9   V9          284807 non-null float64
10  V10         284807 non-null float64
11  V11         284807 non-null float64
12  V12         284807 non-null float64
13  V13         284807 non-null float64
14  V14         284807 non-null float64
15  V15         284807 non-null float64
16  V16         284807 non-null float64
17  V17         284807 non-null float64
18  V18         284807 non-null float64
19  V19         284807 non-null float64
20  V20         284807 non-null float64
21  V21         284807 non-null float64
22  V22         284807 non-null float64
23  V23         284807 non-null float64
24  V24         284807 non-null float64
25  V25         284807 non-null float64
26  V26         284807 non-null float64
27  V27         284807 non-null float64
28  V28         284807 non-null float64
29  Amount      284807 non-null float64
30  Class       284807 non-null int64
dtypes: float64(30), int64(1)
memory usage: 67.4 MB
  
```

Fig 2. Data Set Summary

After importing the dataset and analyzing the dataset and performing data exploration and statistical analysis we further balance the data and separate the dataset to test and train and build a CNN model. So After importing the dataset, we have performed cleaning and then we have split the dataset into fraud and non-fraud data and created a balance data for checking fraud transactions, and plotted a bar graph to analyze the frequency of fraud.

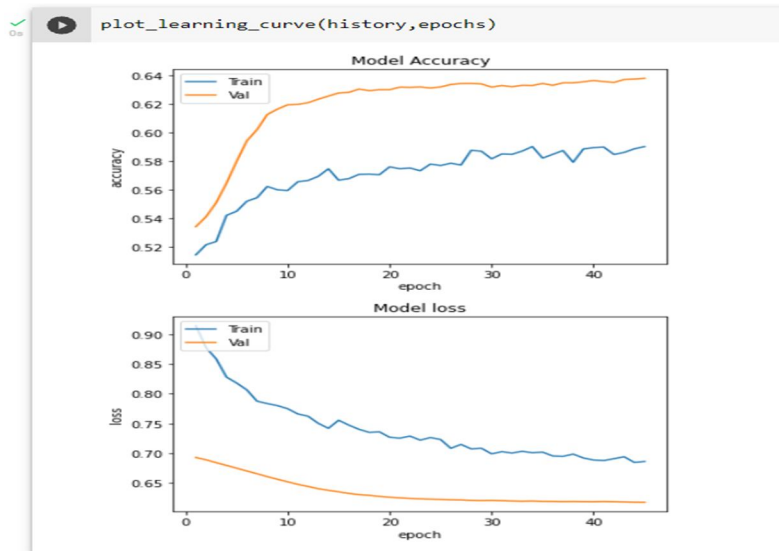


Fig 3. The learning Curve or the model

E. Software Requirement

- 1) Google Collab
- 2) Windows 64bit
- 3) Python Language

IV. RESULT ANDDISCUSSION

The training dataset is passed on to the model and training of the model is done. The accuracy of the model is predicted and printed. Hence, we have acquired the result of an accurate value of credit card fraud detection i.e. 0.9539 (95.3%) by building and training a Convolutional Neural Network model with new enhancements.

In comparison to existing model, this proposed model can be applied for the larger dataset for more accurate result

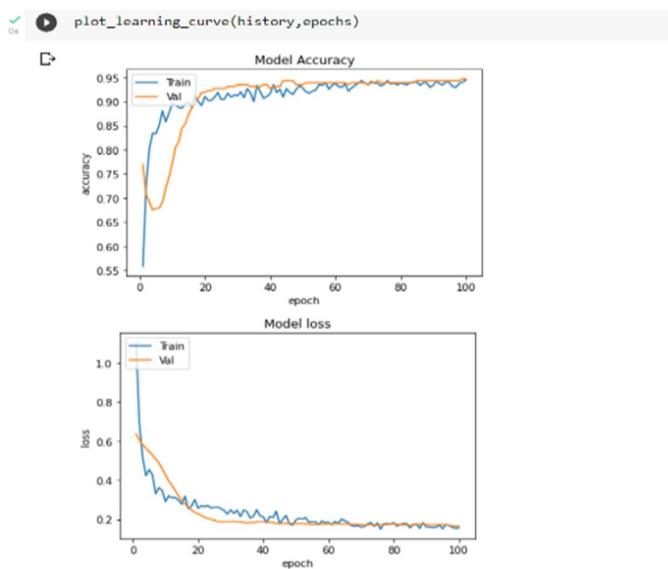


Fig 4. Accuracy and loss for the model

```

logistic regression: 0.9991854161399961
f1_score: 0.6979166666666666
precision_score: 0.8701298701298701
recall_score: 0.5826086956521739

```

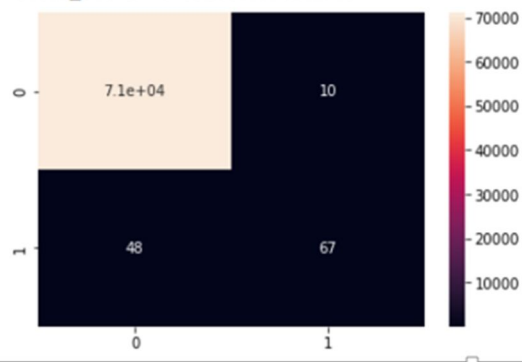


Fig 5. Predicting precision and plotting Confusion Matrix for the target value

V. CONCLUSIONS

In this Credit Card Fraud Detection System project, machine learning algorithms were briefly compared in fraud detection, also a detailed comparative analysis is provided. It is seen that various algorithms give different accuracy in performance. Even though there are numerous fraud discovery approaches we can't state that this specific method distinguishes the fraud. At the point when we look at the precision, recall, and F1-score are 0.8701, 0.5826, and 0.679166 using Logistic Regression accuracy is 0.999185. Accuracy of 0.9539 and loss of-0.1108 using CNN are obtained. Hence we will analyze the possibility of a transaction being a fraud transaction. The CNN algorithm will provide a better performance, but the speed during testing and application will still be an issue.

VI. FUTURE ENHANCEMENT

Nowadays, credit card has become the modern tool for, online payments, and many e-transactions have a credit card transaction option the credential from the credit card is used by the third-party to deduct money. Due to this, we need to analyze and find the best solution to detect the maximum number of frauds in online systems. We will try to implement deep learning algorithms and will further compare which algorithm works best and will test this with real time dataset.

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