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CREDIT CARD FRAUD DETECTION

CREDIT CARD FRAUD DETECTION USING MACHINE LEARNING ALGORITHM WITH LSTM

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ABSTRACT Banking industry has the major activity of lending money to those who are in need of money. In order to payback the principle borrowed from the depositor bank collects the interest made by the principle borrowers. Credit risk analysis is becoming an important field in financial risk management. Many credit risk analysis techniques are used for the evaluation of credit risk of the customer dataset. The evaluation of the credit risk datasets leads to the decision to issue the loan of the customer or reject the application of the customer is the difficult task which involves the deep analysis of the customer credit dataset or the data provided by the customer. In this paper we are surveying different techniques for the credit risk analysis which are used for the evaluation for the credit risk datasets. Credit card fraud is a serious problem in financial services. Machine learning algorithm based fraud detection scheme is implemented for detect the fraud card. The methods which use long short- term memory (LSTM) networks 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 analyzed rate.

Machine learning (ML) is the scientific study of algorithms and statistical models that computer systems use to effectively perform a specific task without using explicit instructions, relying on models and inference instead. It is seen as a subset of artificial intelligence. Machine learning algorithms build a mathematical model of sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to perform the task. Machine learning algorithms are used in the applications of email filtering, detection of network intruders, and computer vision, where it is infeasible to develop an algorithm of specific instructions for performing the task. Machine learning is closely related to computational statistics, which focuses on making

INTRODUCTION

OVERVIEW

Credit card fraud is a wide-ranging term for theft and fraud committed using or involving a payment card, such as a credit card or debit card, as a fraudulent source of funds in a transaction. The purpose may be to obtain goods without paying, or to obtain unauthorized funds from an account. Credit card fraud is also an adjunct to identity theft. According to the United States Federal Trade Commission, while the rate of identity theft had been holding steady during the mid-2000s, it increased by 21 percent in 2008. However, credit card fraud, that crime which most people associate with ID theft, decreased as a percentage of all ID theft complaints for the sixth year in a row.

TASKS

Machine learning tasks are classified into several broad categories. In supervised learning, the algorithm builds a mathematical model of a set of data that contains both the inputs and the desired outputs. For example, if the task were determining whether an image contained certain object, the training data for a supervised learning algorithm would include images with and without that object (the input), and each image would have a label (the output) designating whether it contained the object. In special cases, the input may be only partially available, or restricted to special feedback, Semi-supervised learning algorithms develop mathematical models from incomplete training data, where a portion of the sample inputs are missing the desired output.

predictions using computers. The study of mathematical optimization delivers methods, theory and application domains to the field of machine learning. Data mining is a field of study within machine learning, and focuses on through unsupervised learning. In its application across business problems, machine learning is also referred to as predictive analytics.

The most commonly used techniques in data mining are: Artificial neural networks: Non-linear predictive models that learn through training and resemble biological neural networks in structure. **Decision trees:** Tree-shaped structures that represent sets of decisions. These decisions generate rules for the classification of a dataset. Specific decision tree methods include Classification and Regression Trees (CART) and Chi Square Automatic Interaction Detection (CHAID). **Genetic algorithms:** Optimization techniques that use processes such as genetic combination, mutation, and natural selection in a design based on the concepts of evolution. **Nearest neighbor method:** A technique that classifies each record in a dataset based on a combination of the classes of the k record(s) most similar to it in a historical dataset (where k ³ 1). Sometimes called the knearest neighbor technique. Rule induction: The extraction of useful if-then rules from data based on statistical significance. Pre-processing Before data mining algorithms can be used, a target data set must be assembled. As data mining can only uncover patterns actually present in the data, the target data set must be large enough to contain these patterns while remaining concise enough to be mined within an acceptable time limit. A common source for data is a data mart or data warehouse. Preprocessing is essential to analyze the multivariate data sets before data mining. The target set is then cleaned. Data cleaning removes the observations containing noise and those with missing data.

1.3 LONG SHORT-TERM MEMORY

LSTM stands for Long Short-Term Memory, and it is a type of recurrent neural network (RNN) architecture used in deep learning for sequential data processing. LSTMs are designed to address the limitations of traditional RNNs, which can suffer from the "vanishing gradient" problem when processing long sequences of data.

LSTMs are capable of capturing long-term dependencies in sequential data by using specialized memory cells that can retain information over extended time steps. These memory cells are equipped with gates that control the flow of information, allowing LSTMs to selectively remember, forget, or update information based on the input data and the network's learned weights.

Data mining, the extraction of hidden predictive information from large databases, is a powerful new technology with great potential to help companies focus on the most important information in their data warehouses. Data mining tools predict future trends and behaviors, allowing businesses to make proactive, knowledge-driven decisions. The automated, prospective analyses offered by data mining move beyond the analyses of past events provided by retrospective tools typical of decision support systems. Data mining tools can answer business questions that traditionally were too time consuming to resolve. They scour databases for hidden patterns, finding predictive information that experts may miss because it lies outside their expectations.

The Foundations of Data Mining techniques are the result of a long process of research and product development. This evolution began when business data was first stored on computers, continued with improvements in data access, and more recently, generated technologies that allow users to navigate through their data in real time. Data mining takes this evolutionary process beyond retrospective data access and navigation to prospective and proactive information delivery. Data mining is ready for application in the business community because it is supported by three technologies that are now sufficiently mature: Massive data collection Powerful multiprocessor computers Data mining algorithms Commercial databases are growing at unprecedented rates. A recent META Group survey of data warehouse projects found that 19% of respondents are beyond the 50 gigabyte level, while 59% expect to be there by second quarter of 1996.1. In some industries,

SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

Our existing has made a detail study on fraud detection using the method of natural observation of the events happened from the customer side. The existing has worked on the methods of collecting the data from the social media and framing them in terms of big data models and working on the challenges existed the field. Implemented a system which supports in the detection of the scams or frauds in the field of the business by recording the transactions and there by building a model using data mining models. In existing system AdaBoost algorithm has been implemented. The Random Forest (RF) algorithm has been implemented. Loss from credit card fraud affects the merchants, where they bear all costs, including card issuer fees, charges, and administrative charges.

3.1.1 DRAWBACKS Difficult to identify a fraud credit card. Less Accuracy.

3.2 PROPOSED SYSTEM

The proposed system first step is data collection in this step data collection from Kaggle. After collecting data to processing using machine learning algorithm. The processing data is converted into principle component analysis. In this step using 10 different component. Data splitting process to split a data from principle component analysis

The key components of an LSTM cell include:

1. Input Gate: This gate controls the flow of information from the input data into the memory cell. It determines which information is relevant to be stored in the memory cell and which can be ignored.

2. Forget Gate: This gate controls the flow of information from the previous memory cell to the current time step. It determines which information should be forgotten or erased from the memory cell based on the current input.

3. Output Gate: This gate controls the flow of information from the memory cell to the output at the current time step. It determines how much of the memory cell's content should be exposed as the output.

4. Memory Cell: This is the memory component of the LSTM, which retains information over time steps. It can store and update information from the input gate and the forget gate, and pass it to the output gate.

LSTMs are widely used in various applications that involve sequential data, such as natural language processing (NLP), speech recognition, time series analysis, and many more. Their ability to capture long-term dependencies makes them effective in modeling complex patterns in sequential data, and they have been widely adopted in both research and industry for a wide range of tasks.

Python Technology: Python is an interpreted, high-level, general-purpose programming language. It supports multiple programming paradigms, including procedural, object-oriented, and functional programming. Python is often described as a "batteries included" language due to its comprehensive standard library.

Python Programing Language: Python is a multi-paradigm programming language. Object-oriented programming and structured programming are fully supported, and many of its features support functional programming and aspect-oriented programming (including by metaprogramming and met objects (magic methods)). Many other paradigms are supported via extensions, including design by contract and logic programming. Python uses dynamic typing and a combination of reference counting and a cycle- detecting garbage collector for memory management. It also features dynamic name resolution (late binding), which binds method and variable names during program execution.

and k-told cross validation used. Model development process using machine learning algorithm to train a data to send next step of the process.

Performance evaluation implemented this project using formulas. Finally we deployed the project using model selection. Majority voting is frequently used in data classification, which involves a combined model with at least two algorithms. Machine learning based algorithm is implemented for fraud detection. Each algorithm makes its own prediction for every test sample. It 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. In the proposed system the KNN algorithm is used. The k- nearest neighbour algorithm is a nonparametric method used for classification and regression. By using KNN the processing time is reduced and also process the larger datasets.

3.2.1 ADVANTAGES: Stable system More accuracy Less time to predict the fraud

3.3 SYSTEM ARCHITECTURE A system architecture is the conceptual model that defines the structure, behavior, and more views of a system. A system architecture can consist of system components and the sub-systems

1. developed, that will work together to implement the overall system.

If the accuracy is not acceptable, the Machine Learning algorithm is trained repeatedly with an augmented training data set.

There are two main types of ML approaches, which are supervised and unsupervised.

Python strives for a simpler, less-cluttered syntax and grammar while giving developers a choice in their coding methodology. In contrast to Perl's "there is more than one way to do it" motto, Python embraces a "there should be one and preferably only one obvious way to do it" design philosophy. Alex Martelli, a Fellow at the Python Software Foundation and Python book author, writes that "To describe something as 'clever' is not considered a compliment in the Python culture."

Python's developers strive to avoid premature optimization, and reject patches to non-critical parts of the Python reference implementation that would offer marginal increases in speed at the cost of clarity. When speed is important, a Python programmer can move time-critical functions to extension modules written in languages such as C, or use Py , a just-in-time compiler. Python is also available, which translates a Python script into C and makes direct C-level API calls into the Python interpreter.

Python is meant to be an easily readable language. Its formatting is visually uncluttered, and it often uses English keywords where other languages use punctuation. Unlike many other languages, it does not use curly brackets to delimit blocks, and semicolons after statements are optional. It has fewer syntactic exceptions and special cases than C or Pascal.the input image size as MxM grid and for each grid generation 2 bounding boxes and class probabilities for those bounding boxes is done.

SYSTEM ANALYSIS AND SPECIFICATION

3.1 SYSTEM ANALYSIS

3.1.1 Existing System With the highly rising traffic congestion all around the world, and it's management by traditional approach are not efficient for smooth commutation purpose hence there is a need to come up with a solution which can be globally accepted and would lead for the better management of traffic. In today's world where technology has transcended all barriers it has now become easy to solve most human problems and one of these problems include Traffic Congestion. Traffic congestion has increased drastically over the years and has had negative impacts that include road rage, accidents, air pollution, wastage of fuel and most importantly unnecessary delays. The fact that encouraged proposing new solution is that in many cities of the world, the traffic signal allocation is still based on timer. The Timer Approach has a drawback that even when there is a less traffic in one of the roads, green signal is still allocated to the road till its timer value falls to 0, whereas the traffic on another road is comparably more faces red signal at that time. This causes congestion and time loss to commutators. Most of the present systems are not automated and are prone to human errors. There are many projects emerging in order to convert the current transport system of cities to 'Smart system' and there are many initiatives under this, one of this is Intelligent Transport System. Many initiatives were taken to design a system that can perform real-time monitoring of traffic signals i.e., the traffic signal switching time will not be predefined one, instead the switching time will depend on the count of vehicles on each side of the road. **High-end Graphics Processing Unit:** Machine learning models require a lot of computational power to run on. For any neural network, the training phase of the deep learning model is the most resource-intensive task. Traditionally, the training phase of the deep learning pipeline takes the longest to achieve. This is not only a time-consuming process, but an expensive one. While training, a neural network takes in inputs, which are then processed in hidden layers using weights that are adjusted during training and the model then spits out a prediction. Weights are adjusted to find patterns in order to make better predictions. To significantly reduce training time, we can use machine learning GPUs, which enable us to perform AI computing operations in parallel. GPUs are optimized for training artificial intelligence and deep learning models as they can process multiple computations simultaneously. GPUs are parallel processors designed to accelerate portions of a program, but not to replace CPU computing. The main program is executed on the CPU, but some code fragments, called kernels, are executed on the GPU. These Graphical processing units (GPUs) can reduce these costs, enabling us to run models with massive

An important goal of Python's developers is keeping it fun to use. This is reflected in the language's name a tribute to the British comedy group Monty Python and in occasionally playful approaches to tutorials and reference materials, such as examples that refer to spam and eggs (from a famous
Monty Python sketch) instead of the standard foo and bar. Python strives for a simpler, less cluttered syntax and grammar while giving developers a choice in their coding methodology. In contrast to Perl's "there is more than one way to do it" motto, Python embrace a "there should be
one and preferably only one obvious way to doit" design philosophy. Alex Martelli, a Fellow at the Python Software Foundation and Python book author, writes that "To describe something as 'clever'

SYSTEM DESIGN

INPUT DESIGN The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

- What data should be given as input?
- How the data should be arranged or coded?
- The dialog to guide the operating personnel in providing input.
- Methods for preparing input validations and steps to follow when error occur.

OBJECTIVES

1. Input Design is the process of converting a user-oriented description of the input into a computer-based system. This design is important to avoid errors in the data input process and show the correct direction to the management for getting correct information from the computerized system.

2. It is achieved by creating user-friendly screens for the data entry to handle large

numbers of parameters quickly and efficiently. This is because GPUs enable us to parallelize the training tasks, distributing tasks over clusters of processors and performing compute operations simultaneously. GPUs are also optimized to perform target tasks, finishing computations faster than non-specialized hardware. These processors process the same tasks faster and free the CPUs for other tasks. This eliminates bottlenecks created by compute limitations.

OUTPUT DESIGN

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision making.

1. Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.

2. Select methods for presenting information.

ECONOMICAL FEASIBILITY

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within achieved because most of the technologies used are freely available. Only the customized products had to be purchased achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

SOCIAL FEASIBILITY

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

volume of data. The goal of designing input is to make data entry easier and to be free from errors. The data entry screen is designed in such a way that all the data manipulates can be performed. It also provides record viewing facilities.

3. When the data is entered it will check for its validity. Data can be entered with the help of screens. Appropriate messages are provided as when needed so that the user will not be in maize of instant. Thus the objective of input design is to create an input layout that is easy to follow.

Create document, report, or other formats that contain information produced by the system. tasks.

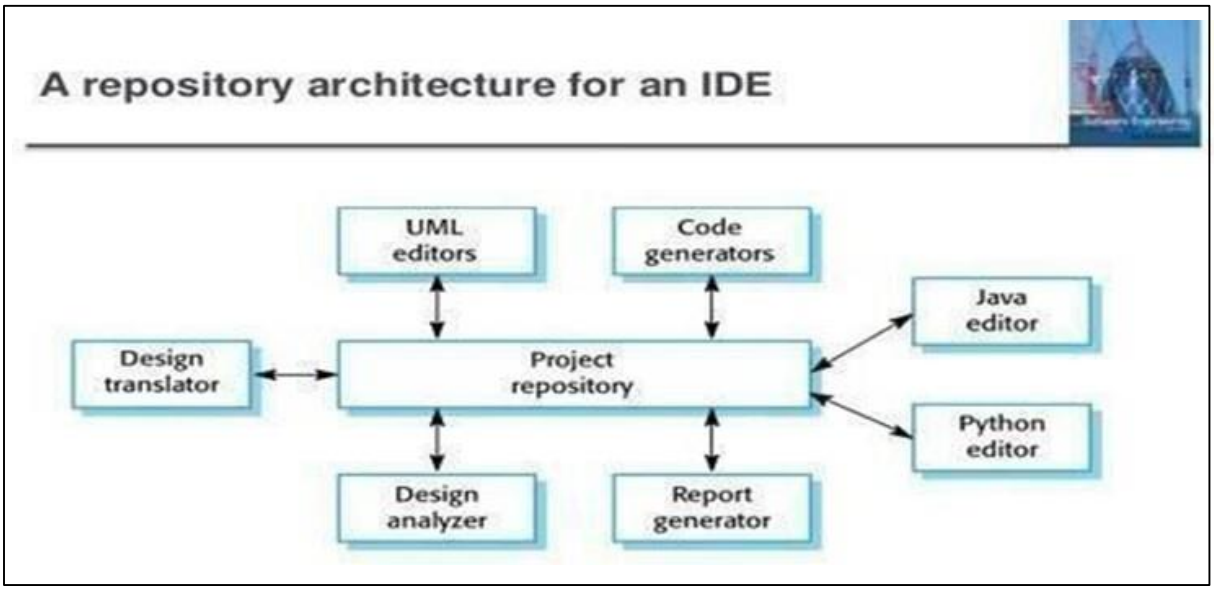
FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential. Three key considerations involved in the feasibility analysis are

- ECONOMICAL FEASIBILITY
- TECHNICAL FEASIBILITY
- SOCIAL FEASIBILITY

TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.



SYSTEM TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover

every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub-assemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

TYPES OF TESTS

Unit testing

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .it is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to

the documented specifications and contains clearly defined inputs and expected results.

Integration testing

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

Functional testing

Functional tests provide systematic demonstrations that functions tested are available as

specified by the business and technical requirements, system documentation, and user manuals.

Functional testing is centered on the following items:

Valid Input :identified classes of valid input must be accepted. Invalid Input : identified classes of invalid input must be

rejected .Functions : identified functions must be exercised. Output : identified classes of application outputs must be exercised. Systems/Procedures : interfacing systems or procedures must be invoked.

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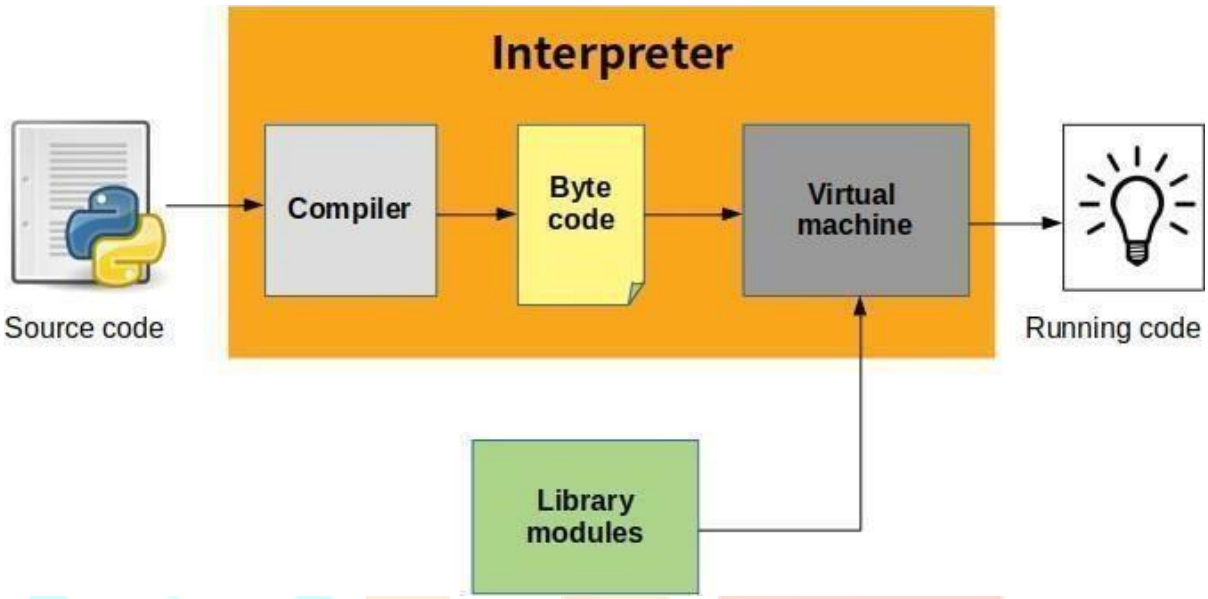


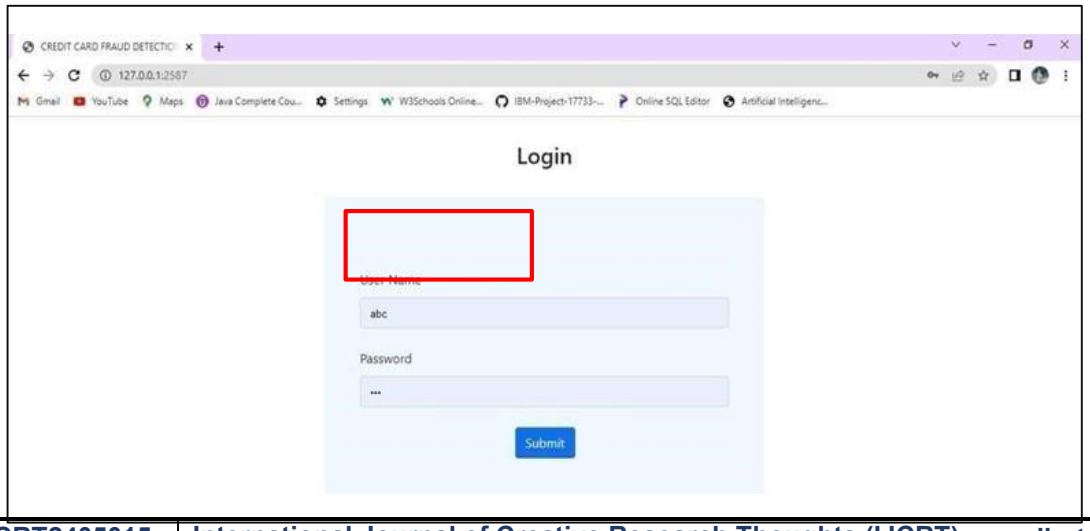
CONCLUSION

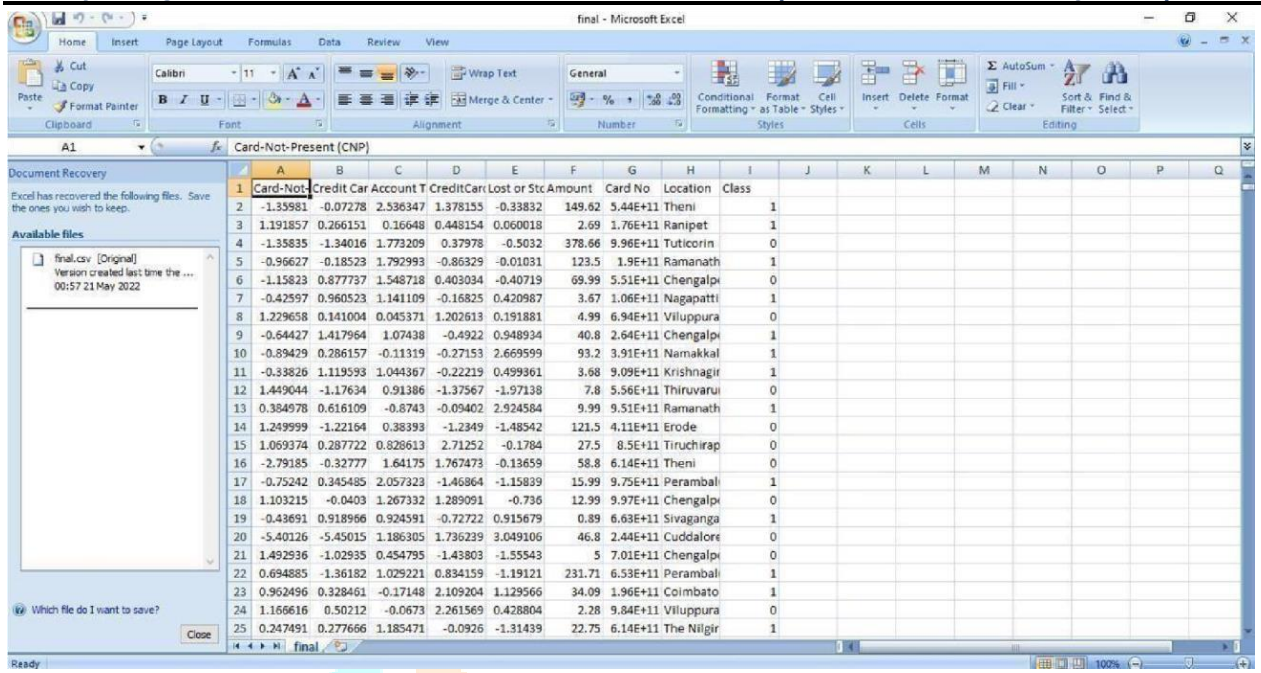
It is worth keep in mind that objective of the paper is to surveying on the different classifier

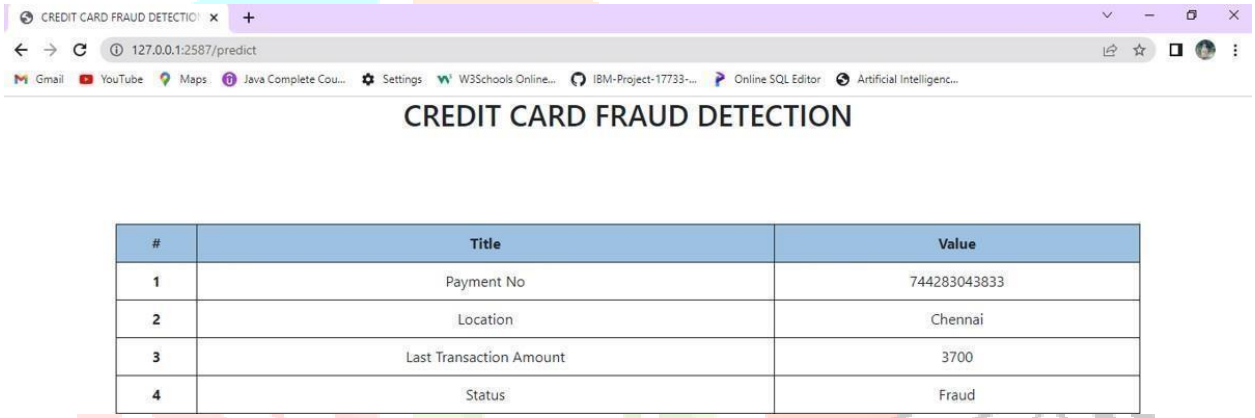
which are used in the credit risk evaluation. In this paper different types of classifiers are discussed and also different types of ensemble classifiers are briefed. The dataset which are used in the classifier is discussed in the paper. We have analyzed and compare their accuracies using different types classifiers and from comparison table we found that the LSTM classifier gives better accuracies compare to other classifiers that is LSTM gives 96.33(%) in German dataset and 96.32(%) in Australian dataset.

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.







#	Title	Value
1	Payment No	744283043833
2	Location	Chennai
3	Last Transaction Amount	3700
4	Status	Fraud

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