IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 8.102 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 12, Issue 5, May 2023

DOI: 10.17148/IJARCCE.2023.125219

Stock Market Prediction Using RNN

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Abstract: Future stock prices are frequently predicted using historical financial entity prices. This paper uses a two-layer reasoning technique to present a novel financial entity price prediction model. The first layer directs the second layer, which relies on learning techniques, using domain knowledge acquired from scientific study.An effective money management approach is added to the model to increase its performance. When choosing whether to buy, sell, or do nothing, this method takes into account the past performance of the model's predictions as well as the investor's available funds. The development of deep learning mining, which seeks to identify profitable technical trading patterns made up of combinations of indicators taken from previous financial data series, distinguishes this work from others. Trading guidelines are regarded as these patterns.

Keywords: Stock Market, RNN.

I. INTRODUCTION

The stock market is renowned for its unpredictability, which is impacted by a wide range of factors and may result in unforeseen gains or losses. To increase market predictability, traditional techniques have been used in conjunction with conventional algorithms and numerical data. Although reliable, these regression models have a tendency to react slowly to substantial changes in society events. The suggested approach seeks to solve the difficulty of spotting trends in the financial markets and offer a cutting-edge method for making wise trading selections. This strategy relies on combining the support count method with recurrent neural network (RNN) algorithms. Effective technical trading patterns that incorporate a combination of indicators from previous financial data series are found by using data mining techniques. Based on their maximal support, these patterns, which are thought of as trading rules, can be divided into three actions: buy, sell, or no-action signals. Then, to categorise trading days during the testing period and enable precise decision-making, the RNN algorithm is used. The analysis shows that the suggested trading system outperforms its competitors, making it advantageous for use in a variety of financial markets. The analysis of historical data for a period of 5–10 years identifies price patterns that represent the psychology and behaviour of crowds. These patterns take into account elements including governmental influences, natural calamities, company earnings, internal corporate issues, and firm fundamentals. Trading choices can be made without the necessity for real-time study of any of these parameters by using technical indicators and the RNN algorithm. Technical charts efficiently combine all the available data, upcoming events, and fundamental components, negating the need for human stock fundamental analysis. The suggested solution offers an automated approach, minimising manual efforts and energy while still allowing for intelligent trading decisions based on the results of the RNN algorithm and the trading rules established from it.

II. LITERATURE SURVEY

According to [1] a thorough analysis of the literature on the use of AI for stock market investments using 2326 papers from the Scopus database published between 1995 and 2019. These studies were separated into four groups: portfolio optimization, artificial intelligence-based stock market forecasting, financial sentiment analysis, and combinations of two or more techniques. The initial, introductory research and its cutting-edge applications are described for each category. A summary of the review also reveals that this field of study is receiving more and more attention, and the literature is getting more detailed and comprehensive.

According to [2] the use of 1D DenseNet and an autoencoder to for ecast closing stock prices using 10 years' worth of Yahoo Finance data for ten illustrious stocks and STIs. Less correlation was seen between the computed STIs as a consequence of the autoencoder's initial input of the generated STIs for dimensionality reduction. The 1D DenseNet was then fed these STIs and the data from Yahoo Finance. The softmax layer, which is a component of the 1D DenseNet

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architecture, uses the output characteristics acquired from the 1D DenseNet as input to anticipate closing stock values from short-, medium-, and long-term perspectives. Our algorithm offered the user one of three proposed signals—buy, sell, or hold—based on the expected patterns of the stock prices.

According to [3] the short term, the market behaves like a voting machine, but in the long run, it behaves like a weighing machine, therefore there is room for longer-term market prediction. A promising field is the use of machine learning methods and other algorithms for stock price research and forecasting. In the first section of this essay, we provide a brief overview of stock markets and a taxonomy of stock market prediction techniques. Then, we concentrate on a few scientific developments in stock analysis and forecasting. We examine methods for stock analysis that are technical, fundamental, short-term, and long-term.

According to [4] employing MS Excel as the finest statistical tool for graph and tabular depiction of prediction findings, with an emphasis on Linear Regression (LR), Three Month Moving Average (3MMA), Exponential Smoothing (ES), and Time Series Forecasting. After using LR, we successfully anticipated the stock market trend for the next month and also assessed accuracy in accordance with measures. We gathered data from Yahoo Finance for the stocks of Amazon (AMZN), Apple (AAPL), and Google (GOOG).

According to [5] the stock market organisations' forecast for the future. From the Tehran Stock Exchange, four groups entitled diversified financials, petroleum, non-metallic minerals, and basic metals were selected for experimental assessments. Based on ten years' worth of historical documents, information for the groupings was gathered. The value forecasts are made for the next 1, 2, 5, 10, 15, 20, and 30 days. Different machine learning techniques were used to forecast future stock market group values. We used artificial neural networks (ANN), recurrent neural network (RNN), long short-term memory, bagging, random forest, adaptive boosting (Adaboost), gradient boosting, and eXtreme gradient boosting (XGBoost) (LSTM). Each of the prediction models' inputs was given ten technical indicators.

According to [6] detailed analysis of 50 research papers recommending methods for stock market prediction, including Bayesian model, fuzzy classifier, artificial neural network (ANN), support vector machine (SVM) classifier, neural network (NN), and machine learning methods. The collected papers are categorised using various prediction and clustering methods. The research gaps and difficulties with the current methods are listed and explained, which aids the researchers in improving the upcoming works.

According to [7] Over the last two decades, both linear and machine learning technologies have been investigated as a successful prediction model. Deep learning models have just been proposed as new horizons for this subject, and the research is moving too quickly for anybody to keep up. A current evaluation of recent efforts on deep learning models for stock market prediction, this survey's purpose is to do just that. Along with classifying the numerous data sources, neural network architectures, and widely used assessment measures, we also consider implementation and repeatability.

According to [8] the long short-term memory neural network with automatic encoder and the deep long short-term memory neural network (LSTM) with embedded layer for stock market forecasting. In order to vectorize the data in these two models so that a long short-term memory neural network can forecast the stock, we use the embedded layer and the automatic encoder, respectively.

According to [9] a thorough analysis of 30 research papers recommending techniques, such as calculation techniques, machine learning algorithms, performance metrics, and top journals. Research questions are used to guide the selection of the studies. As a result, these chosen studies are assisting in the discovery of ML methods and their dataset for stock market prediction. The most popular ANN and NN techniques are used to produce accurate stock market predictions. Despite significant effort, the most recent stock market-related prediction methodology has many drawbacks. In this study, it can be assumed that stock market forecasting is a comprehensive process and those specific parameters for forecasting the stock market ought to be thought of as more accurate.

According to [10] on social media and financial news data to ascertain the effect of this data on the accuracy of stock market forecasting for ten additional days. Feature selection and spam tweet reduction are carried out on the data sets to enhance performance and quality of predictions. Additionally, we do trials to identify stock markets that are challenging to forecast as well as those that are more influenced by social media and financial news. We evaluate the outcomes of several methods to identify a reliable classifier. Finally, deep learning is used to provide predictions with the highest degree of accuracy, and certain classifiers are ensembled.

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III. SOFTWARE REQUIREMENT SPECIFICATION

Technologies and tools used in Policy system project are as follows Technology used:
Front End

- Internet Explorer 6.0/above
- Tools: Eclipse or net beans, Heidi SQL, JDK 1.7 or Higher
- Programming Language: JAVA/J2EE

Back-End

- MYSQL 5.1
- Heidi SQL

IV. EXTERNAL INTERFACE REQUIREMENT

A. USER INTERFACES

The usability of the application interface will be prioritized , with a functional and minimalist design. Users may easily navigate because every choice will be given in a menu-based fashion. To improve the interface's usability, the desktop app will be used to set up the page layout and apply simple styling.

B. HARDWARE INTERFACES

It will be necessary to have a webserver so that the students and mess administrator can connect to it and communicate. All of the data entries are stored in a database on the servers. The Server must be connected to the college's local network through a fast 1 Gigabit Ethernet connection**.**

C. SOFTWARE INTERFACES

The database of clients that connect to the server over JDBC is stored using MySQL.

D. COMMUNICATION INTERFACES

The program's whole feature set is accessible offline. To download the application, update it, and (optionally) receive some target images for your personal profile, all you need is an internet connection. Our project is Android-based, which allows us to connect users online via a request and response form. We will use for that HTTP protocol. Internet Protocol An application protocol for distributed, collaborative, and hypermedia information systems is the Hypertext Transfer Protocol. The World Wide Web's data communication is built on HTTP. Hypertext is structured text that connects text-containing nodes with logical linkages (hyperlinks).

V. NON FUNCTIONAL REQUIREMENTS

A. PERFORMANCE REQUIREMENTS

Systems can only achieve their performance goals if they are described in a clear and unambiguous manner. It is a basic fact that system designers would typically overlook performance difficulties if performance is not a declared criterion of the system requirements. While poorly defined or vague performance specifications may result in disagreements between customers and providers. Performance criteria are frequently never ridged because other factors, such time to market, may allow for the delivery of a system that only partially satisfies its declared performance requirements.
In order to assess the performance of a system the following must be clearly specified:

- Response Time
- Workload
- Scalability
- Platform

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B. SAFETY REQUIREMENTS

This specification must be sufficiently specific such that the design and implementation can achieve the necessary safety integrity and enable a functional safety evaluation.

C. SECURITY REQUIREMENTS

This specification must be sufficiently specific such that the design and implementation can achieve the necessary safety integrity and enable a functional safety evaluation.

D. SOFTWARE QUALITY ATTRIBUTES

System must be portable; it can be used to run either a big network of computers or only two connected systems. The system is maintainable, meaning that its characteristics may be altered in the future to satisfy demands.

VI. SYSTEM REQUIREMENTS

A. DATABASE REQUIREMENTS

- It should be MySQL database on platform.
- Database must be integrated with key constraints
- It should be maintain the relational base on RDMS and normalization
- System will create database backup on periodic basis.
- It will execute all commands like DML, DDL and DCL as well as we required some security measurements for sql injection.

B. SOFTWARE REQUIREMENTS

Technologies and tools used in Policy system project are as follows Technology used:

Front End

- Internet Explorer 6.0/above
- Tools: Eclipse or net beans, Heidi SQL, JDK 1.7 or Higher
- Programming Language: JAVA/J2EE

Back-End

- MYSQL 5.1
- Heidi SQL

C. HARDWARE REQUIREMENTS

- Processor:- Intel Pentium 4 or above
- Memory:- 2 GB or above
- Other peripheral:- Printer
- Hard Disk:- 500gb

VII. ANALYSIS MODELS : SDLC MODEL TO BE APPLIED

This project plan provides the framework for carrying out and keeping track of all project-related tasks. It will be used for the duration of the project and will be consistently updated to appropriately reflect current status and future goals. The project strategy for the programme is shown in Fig 1. The project's initial phase consisted of obtaining specifications and planning. Understanding the problem statement and assuring the system's dependability were the main concerns throughout this phase. Additionally, data on the required hardware and software was gathered. A draught design that depicts the project's workflow was created during the design process. The blueprint for subsequent growth is provided by this design. The actual implementation of the system happens during the coding stage. The project's Chapter 5 comprises the study.

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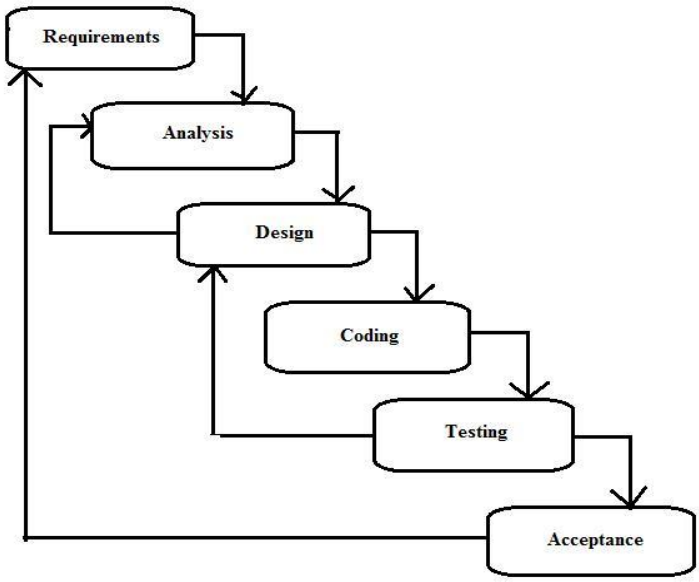

Fig. 1 Project Plan

Testing, the last step in the development process, is vital in establishing whether the system satisfies the requirements. There are many different testing methodologies, and in Chapter 6 we go through particular testing-related parameters. To make sure the system works as planned, testing is done. The system can move on to user acceptance testing if the testing method yields satisfactory results. However, the entire plan might need to be redone if any adjustments or tweaks are required. The waterfall methodology is being used for software development and testing in this system. User acceptance testing comes after system acceptance testing in the testing phase, and it acts as the last assurance that the system is reliable and ready for implementation.

VIII. SYSTEM IMPLEMENTATION PLAN

A. Data Collection

The stock market dataset used in this study was sourced from Kaggle as well as several real-time data sources. Information was explicitly gathered from aviation companies as part of the data collection procedure. The extraction, analysis, and use of this data were done with great care, and machine learning methods were then applied. The major goal of this research was to produce precise predictions for stock market outcomes based on the effectiveness and accuracy of the used algorithms.

B. Pre-processing and Normalization

A rigorous data preparation process is carried out in order to eliminate potential difficulties including irrelevant information and data gaps. This calls for the use of a variety of data pre-processing techniques, such as data reduction, data transformation, and data purification. Aiming to reduce noise, eliminate inconsistencies, and fill in any missing numbers, the data must be cleaned and organised. Effective data preparation makes the data more suited for later analysis and modelling, providing more precise and trustworthy conclusions.

C. Feature Extraction and Selection

This procedure involves extracting a wide range of features from the supplied data. The redundant and unneeded qualities that are not necessary for training are then removed by standardising these features using a predetermined threshold for feature selection. Through a combination of various methodologies, the normalised data is used to produce hybrid attributes along with its relational features. Finally, a good optimisation method is chosen, and the retrieved features and hybrid attributes are used to train the model. By using this strategy, the model is trained on the most pertinent and instructive data possible, improving both performance and accuracy.

D. Classification

After the module has been successfully completed, the selected features are sent as input to the training module, which creates thorough system background knowledge. Testing data can be introduced into the training model after it has been created to produce classification predictions.

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The testing step includes the preprocessing, vectorization, and classification of the testing text. Utilising a variety of machine learning techniques, the testing module evaluates the system's ability to predict outcomes. This meticulous testing procedure guarantees the precision and dependability of the system's predictions.

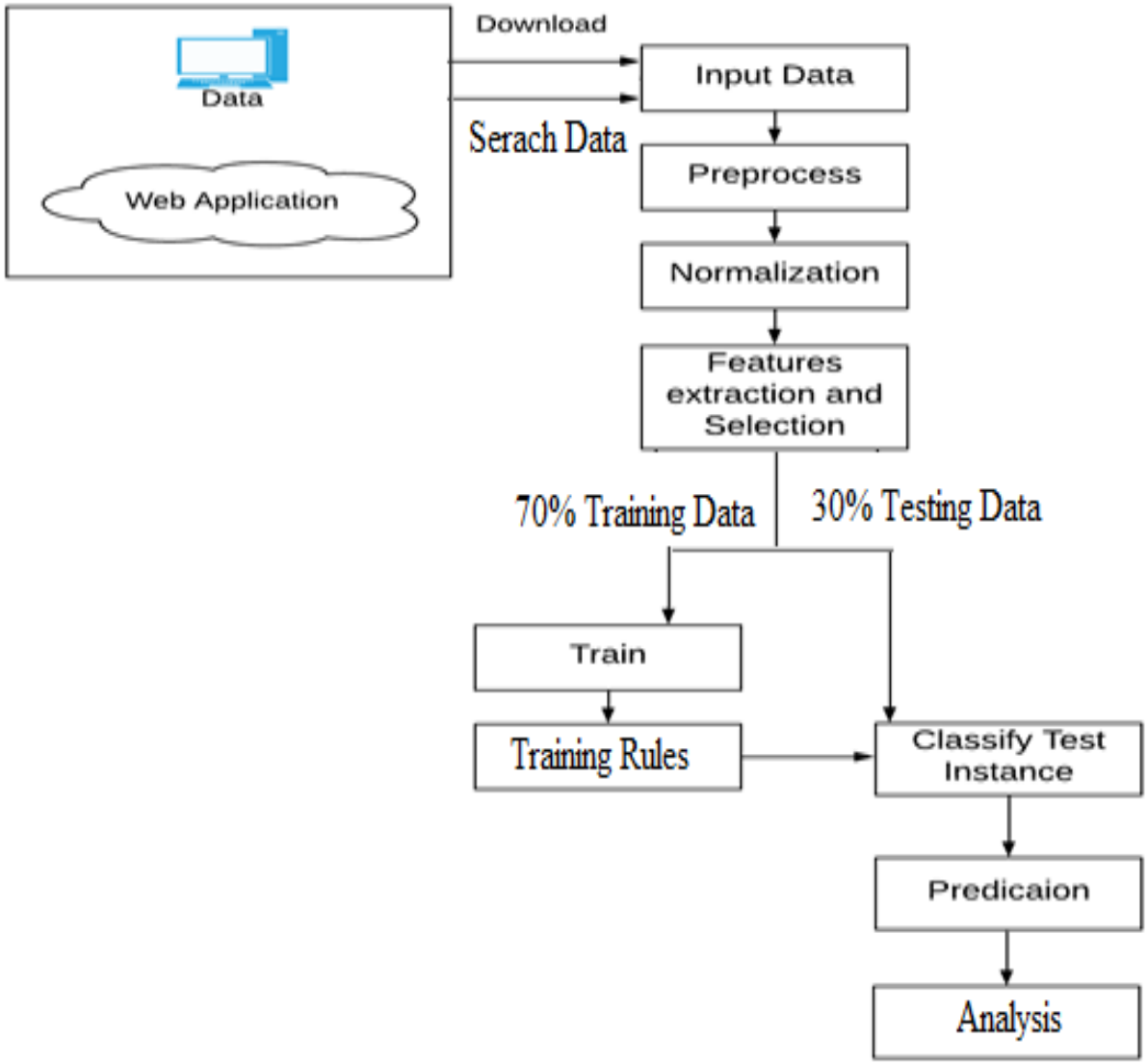

Fig. 2 System Architecture

Fig. 3 DFD 0 Level

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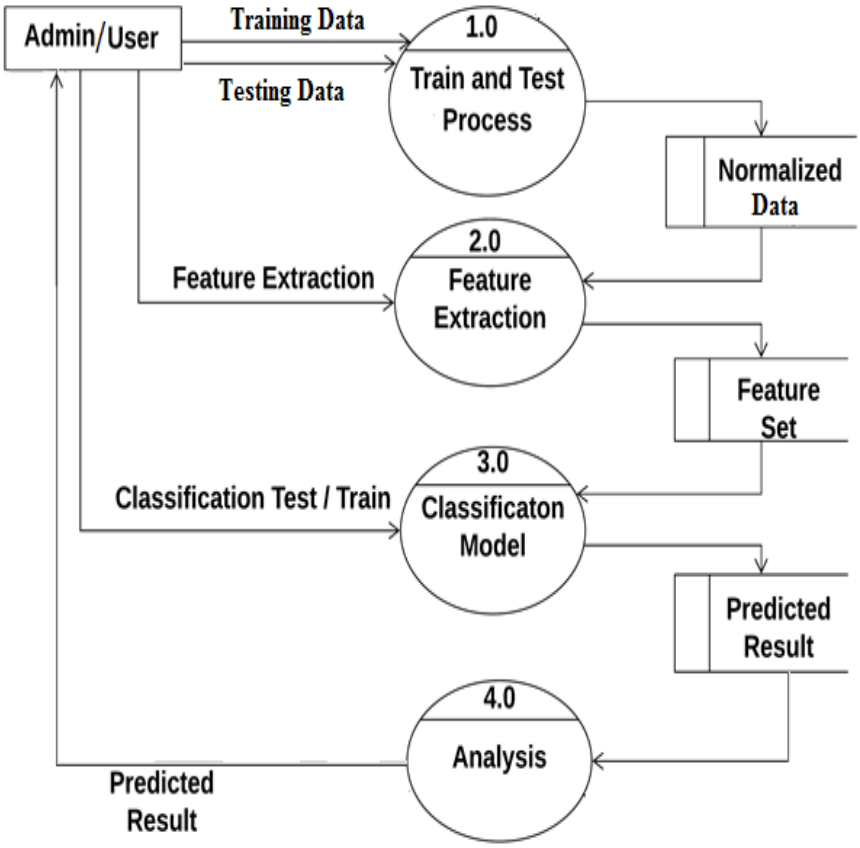

Fig. 4 DFD Multilevel

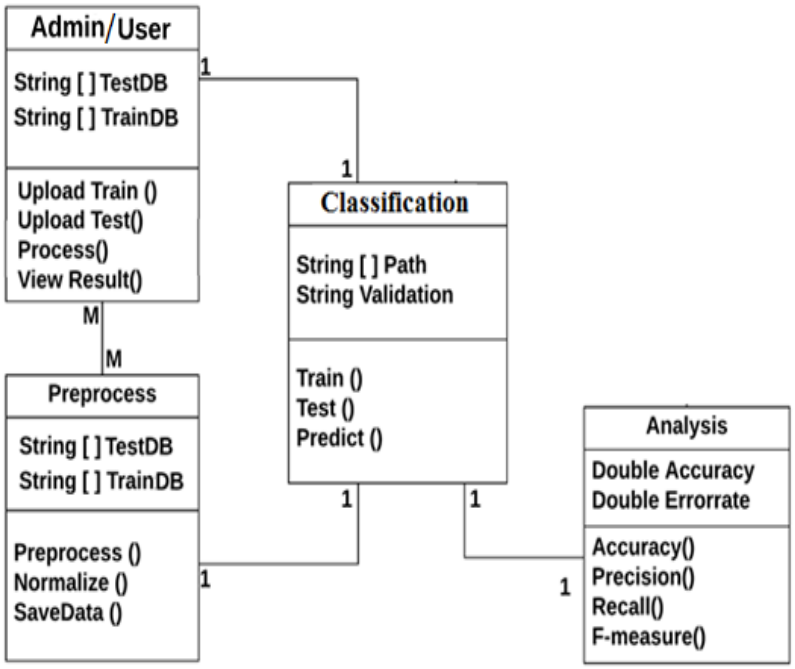

Fig. 5 Class Diagram

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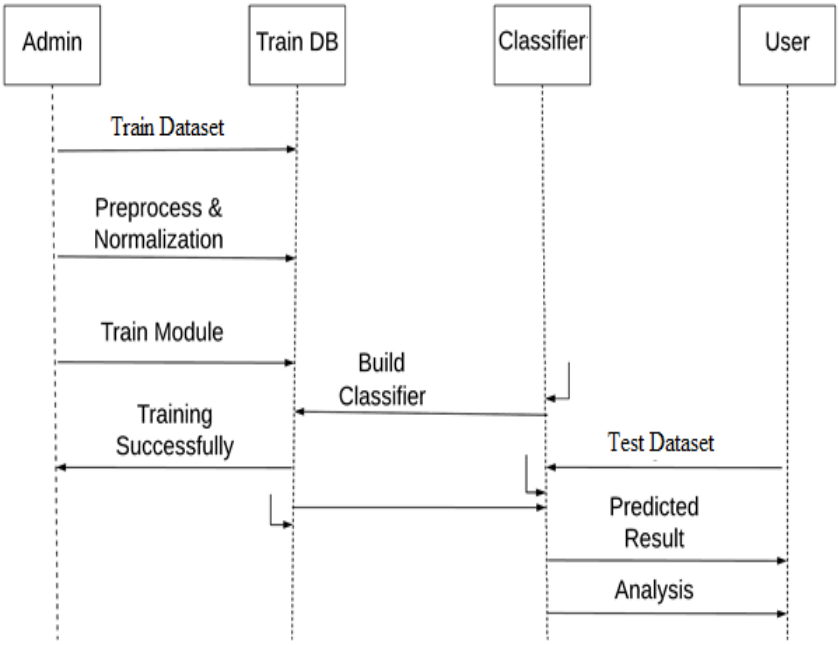

Fig. 6 Sequence Diagram

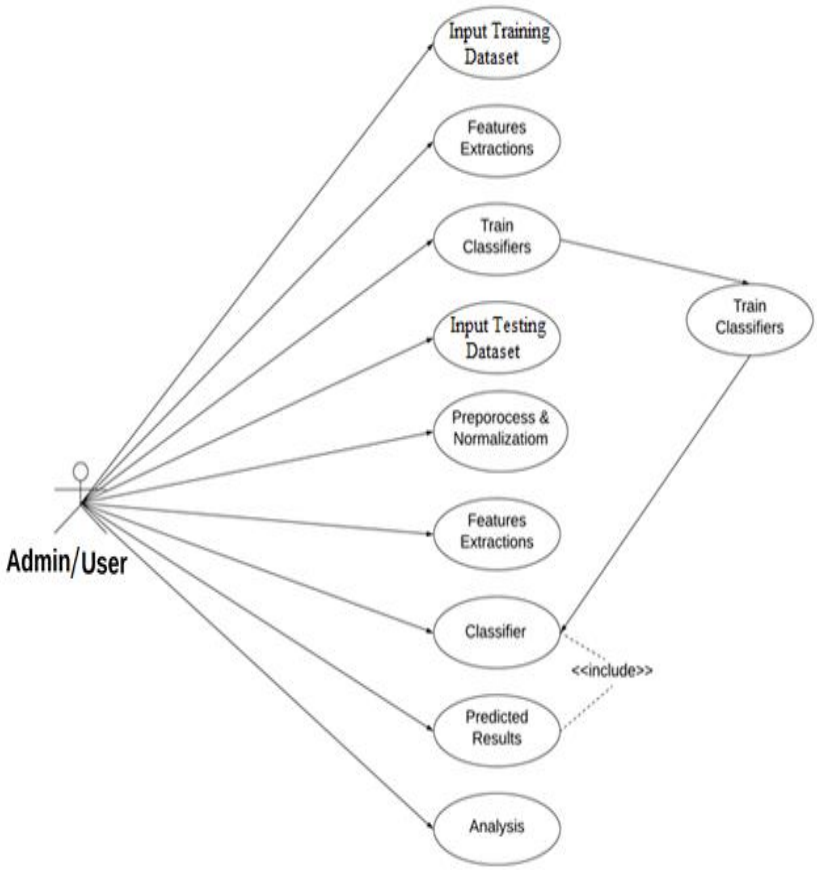

Fig. 7 Use Case Diagram

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IX. OTHER SPECIFICATION

A. ADVANTAGES

- The predicting stock market trade can improve user satisfaction, which will result in a positive impact on the user economy.
- Works anywhere in the world.
- It delivers the results immediately.

B. LIMITATIONS

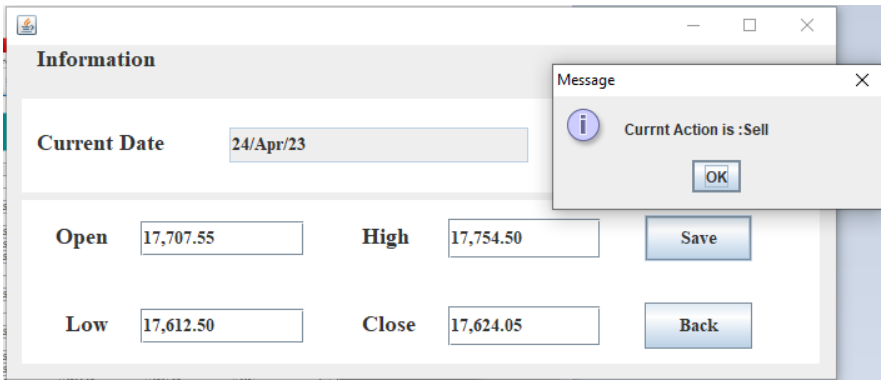
- Data Exchange Challenges
- More resource use

C. APPLICATIONS

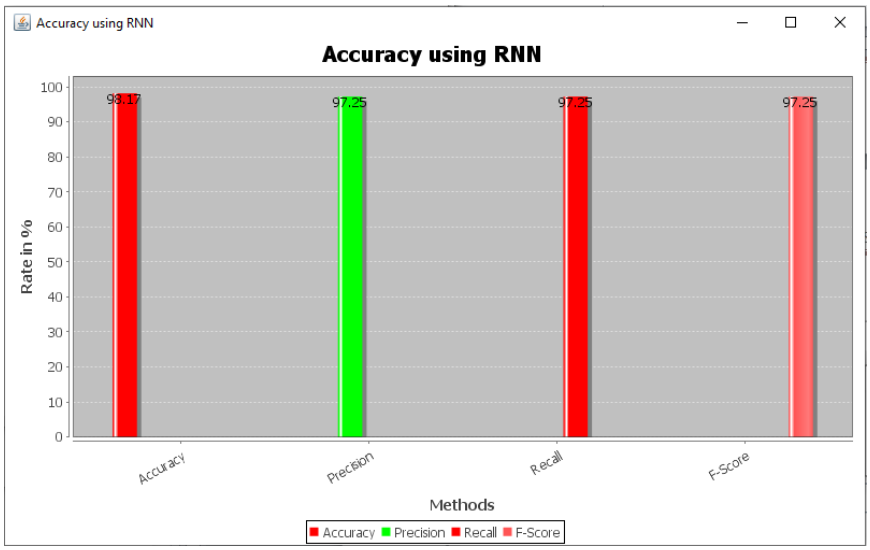
- Prediction detection system.
- Surveillance system.
- Financial Data Analysis
- Telecommunication Industry
- Network monitoring system

X. RESULTS

A. Prediction Page



B. Analysis



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XI. CONCLUSION

In the proposed system, our focus was on studying and applying RNN algorithms and deep learning techniques to historical data, particularly in the context of financial markets or benchmark data. We successfully utilized the RNN algorithm to process historical financial data, calculate technical indicators, and generate trend plots. These trend plots were then used to make decisions regarding whether to buy, sell, or take no action. The goal of the proposed system is to assist technical analysts in making accurate trading decisions and investment strategies. By leveraging the RNN algorithm, we developed a system that can analyze historical data and generate trading rules. These trading rules are derived from the patterns identified through deep learning techniques. They are classified into three trading actions: buy, sell, or no-action signals. The generated trading rules serve as indicators for buy, sell, or no-action decisions, providing valuable insights to traders. This approach allows technical analysts to make informed decisions based on the detected patterns and trading rules derived from the RNN algorithm.

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