Project Report

on

Stock Price Prediction Using Technical Analysis

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2022-23

SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING,

SHEGAON – 444 203 (M.S.)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that **Ms. Ankita Kasab, Ms. Shivani Dahake, Ms. Namrata Hiwale and Ms. Swati Khatri** students of final year B.E. in the year 2022-23 of Computer Science and Engineering Department of this institute has completed the project work entitled "**Stock Price Prediction using Technical Analysis**" based on syllabus and has submitted a satisfactory account of his work in this report which is recommended for the partial fulfillment of degree of Bachelor of Engineering in Computer Science and Engineering.

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Project Guide

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Internal Examiner | **External Examiner**

Date: | **Date:**

ABSTRACT

Investors must have access to timely, accurate information in order to trade stocks effectively. Since many companies are traded on a stock exchange, a variety of factors affect the choice. In addition, it is difficult to foresee how stock prices will behave. The technique of predicting stock prices is crucial and difficult for the reasons mentioned above. Finding the predictive model with the lowest error rate and highest accuracy thus becomes a study topic. This work is our suggestion for solving the issue. In this work, we develop a model based on technical analysis which used Long Short-Term Memory (LSTM) algorithm to forecast the stock price of a company for the next 30 days. We collect historical stock data from the Yahoo Finance API using the yfinance library in Python and preprocess it using MinMaxScaler. In addition to the model development, we have created a web application. This application allows users to input the stock symbol of a company and get the predicted stock price for the next 30 days. The predicted values are displayed using a line chart, which provides users with a visual representation of the predicted stock price. Overall, this work provides an effective and accurate way of predicting the stock value of a company, which can be beneficial for investors in making informed decisions. The web application provides a user-friendly interface, making it easily accessible to anyone interested in predicting the stock price of a company

ACKNOWLEDGEMENT

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Also, I would like to thanks to all teaching and non-teaching staff of the department for their encouragement, cooperation and help. My greatest thanks are to all who wished me success especially my parents, my friends whose support and care makes me stay on earth.

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Final Year B. E
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Abbreviation

LSTM	Long Short Term Memory
RF	Random Forest

Chapter 1

INTRODUCTION

1. INTRODUCTION

1.1 PREFACE

Technical analysis is a trading discipline employed to evaluate investments and identify trading opportunities by analyzing statistical trends gathered from trading activity, such as price movement and volume. Unlike fundamental analysis, which attempts to evaluate a security's value based on business results such as sales and earnings, technical analysis focuses on the study of price and volume.

Technical analysis tools are used to scrutinize the ways supply and demand for a security will affect changes in price, volume, and implied volatility. It operates from the assumption that past trading activity and price changes of a security can be valuable indicators of the security's future price movements when paired with appropriate investing or trading rules. It is often used to generate short-term trading signals from various charting tools, but can also help improve the evaluation of a security's strength or weakness relative to the broader market or one of its sectors. This information helps analysts improve their overall valuation estimate.

Technical analysis can be applied to any security with historical trading data. This includes stocks, futures, commodities, fixed-income, currencies, and other securities. In fact, technical analysis is far more prevalent in commodities and forex markets were trades focus on short-term price movements. It attempts to forecast the price movement of virtually any tradable instrument that is generally subject to forces of supply and demand, including stocks, bonds, futures, and currency pairs. In fact, some view technical analysis as simply the study of supply and demand forces as reflected in the market price movements of a security.

The financial market is a dynamic and composite system where people can buy and sell currencies, stocks, equities and derivatives over virtual platforms supported by brokers. The stock market allows investors to own shares of public companies through trading either by exchange or over the counter markets. This market has given investors the chance of gaining money and having a prosperous life through investing small initial amounts of money, low risk compared to the risk of opening new business or the need of high salary career.

Stock markets are affected by many factors causing the uncertainty and high volatility in the market. Although humans can take orders and submit them to the market, automated trading systems (ATS) that are operated by the implementation of computer programs can perform better and with higher momentum in submitting orders than any human. However, to evaluate and control the performance of ATSs, the implementation of risk strategies and safety measures applied based on human judgements are required. Many factors are incorporated and considered when developing an ATS, for instance, trading strategy to be adopted, complex mathematical functions that reflect the state of a specific stock, machine learning algorithms that enable the prediction of the future stock value, and specific news related to the stock being analysed.

Time-series prediction is a common technique widely used in many real-world applications such as weather forecasting and financial market prediction. It uses the continuous data in a period of time to predict the result in the next time unit. Many time series prediction algorithms have shown their effectiveness in practice. The most common algorithms now are based on Recurrent Neural Networks (RNN), as well as its special type - Long-short Term Memory (LSTM). Stock market is a typical area that presents time-series data and many researchers' studies on it and proposed various models. In this project, LSTM model is used to predict the stock price.

1.2 MOTIVATION

Businesses primarily run over customer's satisfaction, customer reviews about their products. Shifts in sentiment on social media have been shown to correlate with shifts in stock markets. Identifying customer grievances thereby resolving them leads to customer satisfaction as well as trustworthiness of an organization. Hence there is a necessity of an un biased automated system to classify customer reviews regarding any problem. In today's environment where we're justifiably suffering from data overload (although this does not mean better or deeper insights), companies might have mountains of customer feedback collected; but for mere humans, it's still impossible to analyse it manually without any sort of error or bias. Oftentimes, companies with the best intentions find themselves in an insights vacuum. You know you need insights to inform your decision making and you know that you're lacking them, but don't know how best to get them. Sentiment analysis provides some answers into what the most important issues are, from the perspective of customers, at least. Because sentiment analysis can be automated, decisions can be made based on a significant amount of data rather than plain intuition.

1.3 PROBLEM STATEMENT

Stock market investors and traders face challenges in predicting the future stock prices with high accuracy, as the stock market is highly volatile and unpredictable. This uncertainty often leads to financial losses and missed opportunities. To solve this problem, we aim to develop model which predict the stock prices accurately.

1.4 AIM

- The project is aimed to develop a LSTM-based model that can predict the future stock prices using technical analysis.
- The project also aims to create a user-friendly web application that allows users to input the required parameters and get a predicted stock price

1.5 OBJECTIVE

The main objective of this project is to provide a model with user friendly web application for accurate stock price prediction. Some main objectives are as follows:

- To study technical parameter for prediction.
- To develop LSTM model for stock price prediction.
- To develop RF model for stock price prediction.

1.6 SCOPE OF PROJECT

The scope of this project includes collecting historical data for the stock market, preprocessing the data, training the LSTM model, and deploying the model in a web application. The web application will provide users with an interface to input the parameters required for the model and receive a predicted stock price. The project also includes creating a responsive design using Flask, HTML, CSS, Bootstrap, and JavaScript.

1.7 ORGANIZATION OF REPORT

The project is organized as follows: -

1. Chapter 1 gives a project overview. This part contains the summary of our project. The explanation of the problem and the reason behind our motivation are also explained in this section. Here, we discuss our project's purpose, goal, and scope.
2. Chapter 2 gives us a brief of previous researches.
3. Chapter 3 provides details on methodology. The LSTM module and data preparation are described along with the importation of libraries and data. This chapter includes the algorithms we used in our project, including LSTM and RF.
4. Chapter 4 provides the system for the project's conceptualization and analysis. This section describes the architecture and operation of the LSTM as well as some UML and structural charts. The fundamental requirements are listed.
5. Chapter 5 presents the results of our project. The chapter includes webpages of our prediction and forecast value graphs.
6. Chapter 5 presents the future scope of our project. Here, we describe the process of adding new material to our project.

Chapter 2

LITERATURE SURVEY

2. LITERATURE SURVEY

2.1 INTRODUCTION

"What other people think" has always been an important piece of information for most of us during the decision-making process. The Internet and the Web have now (among other things) made it possible to find out about the opinions and experiences of those in the vast pool of people that are neither our personal acquaintances nor well-known professional critics — that is, people we have never heard of. And conversely, more and more people are making their opinions available to strangers via the Internet. The interest that individual users show in online opinions about products and services, and the potential influence such opinions wield, is something that is driving force for this area of interest. And there are many challenges involved in this process which needs to be walked all over in order to attain proper outcomes out of them. In this survey we analyzed basic methodology that usually happens in this process and measures that are to be taken to overcome the challenges being faced.

2.2 EXISTING METHODS

2.2.1 Stock Market Prediction Using Machine Learning

The research work done by V Kranthi Sai Reddy Student, ECM, Sreenidhi Institute of Science and Technology, Hyderabad, India. In the finance world stock trading is one of the most important activities. Stock market prediction is an act of trying to determine the future value of a stock other financial instrument traded on a financial exchange. This paper explains the prediction of a stock using Machine Learning. The technical and fundamental or the time series analysis is used by the most of the stockbrokers while making the stock predictions. The programming language is used to predict the stock market using machine learning is Python. In this paper they propose a Machine Learning (ML) approach that will be trained from the available stocks data and gain intelligence and then uses the acquired knowledge for an accurate prediction. In this context this study uses a machine learning technique called Support Vector Machine (SVM) to predict.[1][12]

2.2.2 Forecasting the Stock Market Index Using Artificial Intelligence Techniques

The research work done by Lufuno Ronald Marwala A dissertation submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Science in Engineering. The weak form of Efficient Market hypothesis (EMH) states that it is impossible to forecast the future price of an asset based on the information contained in the historical prices of an asset. This means that the market behaves as a random walk and as a result makes forecasting impossible. Furthermore, financial forecasting is a difficult task due to the intrinsic complexity of the financial system. The objective of this work was to use artificial intelligence (AI) techniques to model and predict the future price of a stock market index.

Two techniques are used to benchmark the AI techniques, namely, Autoregressive Moving Average (ARMA) which is linear modelling technique and random walk (RW) technique. The experimentation was performed on data obtained from the Johannesburg Stock Exchange.[2][14]

2.2.3 Indian stock market prediction using artificial neural networks

The research work done by Dharmaraja Selvamuthu, Vineet Kumar and Abhishek Mishra Department of Mathematics, Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110016, India. A stock market is a platform for trading of a company's stocks and derivatives at an agreed price. Supply and demand of shares drives the stock market. In any country stock market is one of the most emerging sectors. Nowadays, many people are indirectly or directly related to this sector. Therefore, it becomes essential to know about market trends. Thus, with the development of the stock market, people are interested in forecasting stock price. But, due to dynamic nature and liable to quick changes in stock price, prediction of the stock price becomes a challenging task. Stock m Prior work has proposed effective methods to learn event representations that can capture syntactic and semantic information over text corpus, demonstrating their effectiveness for downstream tasks such as script event prediction. On the other hand, events extracted from raw texts lacks of common-sense knowledge, such as the intents and emotions of the event participants, which are useful for distinguishing event pairs when there are only subtle differences in their surface realizations.[3][19]

2.2.4 The Stock Market and Investment

The research work done by Manh Ha Duong Boriss Siliverstovs. Investigating the relation between equity prices and aggregate investment in major European countries including France, Germany, Italy, the Netherlands and the United Kingdom. Increasing integration of European financial markets is likely to result in even stronger correlation between equity prices in different European countries. This process can also lead to convergence in economic development across European countries if developments in stock markets influence real economic components, such as investment and consumption. Indeed, our vector autoregressive models suggest that the positive correlation between changes equity prices and investment are, in general, significant. Hence, monetary authorities should monitor reactions of share prices to monetary policy and their effects on the business cycle.[4][13]

2.2.5 Automated Stock Price Prediction Using Machine Learning

The research work done by Mariam Moukalled Wassim El-Hajj Mohamad Jaber Computer Science Department American University of Beirut.Traditionally and in order to predict market movement, investors used to analyse the stock prices and stock indicators in addition to the news related to these stocks. Hence, the importance of news on the stock price movement. Most of the previous work in this industry focused on either classifying the released market news as (positive, negative, neutral) and demonstrating their effect on the stock price or focused on the historical price movement and predicted their future movement. In this work, we propose an automated trading system that integrates mathematical functions, machine learning, and other external factors such as news' sentiments for the purpose of achieving better stock prediction accuracy and issuing profitable trades. Particularly, we aim to determine the price or the trend of a certain stock for the coming end-of-day considering the first several trading hours of the day. To achieve this goal, we trained traditional machine learning algorithms and created/trained multiple deep learning models taking into consideration the importance of the relevant news. Various experiments were conducted, the highest accuracy (82.91%) of which was achieved using SVM for Apple Inc. (AAPL) stock. [5][20]

2.2.6 Stock Price Correlation Coefficient Prediction with ARIMA-LSTM Hybrid Model

The research work done by Hyeong Kyu Choi, B.A Student Dept. of Business Administration Korea University Seoul, Korea. Predicting the price correlation of two assets for future time periods is important in portfolio optimization. We apply LSTM recurrent neural networks (RNN) in predicting the stock price correlation coefficient of two individual stocks. RNN's are competent in understanding temporal dependencies. The use of LSTM cells further enhances its long-term predictive properties. To encompass both linearity and nonlinearity in the model, we adopt the ARIMA model as well. The ARIMA model filters linear tendencies in the data and passes on the residual value to the LSTM model.[6][15]

2.2.7 Event Representation Learning Enhanced with External Common-sense Knowledge

The research work done by Xiao Ding, Kuo Liao, Ting Liu, Zhongyang Li, Junwen Duan Research Center for Social Computing and Information Retrieval Harbin Institute of Technology, China. Prior work has proposed effective methods to learn event representations that can capture syntactic and semantic information over text corpus, demonstrating their effectiveness for downstream tasks such as script event prediction. On the other hand, events extracted from raw texts lacks of common-sense knowledge, such as the intents and emotions of the event participants, which are useful for distinguishing event pairs when there are only subtle differences in their surface realizations. To address this issue, this paper proposes to leverage external common-sense knowledge about the intent and sentiment of the event.[7][16]

2.2.8 An innovative neural network approach for stock market prediction

The research work done by Xiongwen Pang, Yanqiang Zhou, Pan Wang, Weiwei Lin. To develop an innovative neural network approach to achieve better stock market predictions. Data were obtained from the live stock market for real-time and off-line analysis and results of visualizations and analytics to demonstrate Internet of Multimedia of Things for stock analysis. To study the influence of market characteristics on stock prices, traditional neural network algorithms may incorrectly predict the stock market, since the initial weight of the random selection problem can be easily prone to incorrect predictions. Based on the development of word vector in deep learning, we demonstrate the concept of "stock vector." The input is no longer a single index or single stock index, but multi-stock high-dimensional historical data. We propose the deep long short-term memory neural network (LSTM) with embedded layer and the long short-term memory neural network with automatic encoder to predict the stock market.[8][21]

2.2.9 An Intelligent Technique for Stock Market Prediction

The research work done by M. Mekayel Anik · M. Shamsul Arefin (B) Department of Computer Science and Engineering, Chittagong University of Engineering and Technology, Chittagong, Bangladesh. A stock market is a loose network of economic transactions between buyers and sellers based on stocks also known as shares. In stock markets, stocks represent the ownership claims on businesses. These may include securities listed on a stock exchange as well as those only traded privately. A stock exchange is a place where brokers can buy and/or sell stocks, bonds, and other securities. Stock market is a very vulnerable place for investment due to its volatile nature. In the near past, we faced huge financial problems due to huge drop in price of shares in stock markets worldwide. This phenomenon brought a heavy toll on the international as well as on our national financial structure. Many people lost their last savings of money on the stock market.[9][17]

2.2.10 Forecasting Directional Movements of Stock Prices for Intraday Trading Using LSTM And Random Forests

The research work done by pushpendu ghosh, ariel neufeld, jajati keshari sahoodepartment of computer science & information systems, bits pilani k.k.birla goa campus, india bdivision of mathematical sciences, nanyang technological university, singapore cdepartment of mathematics, bits pilani k.k.birla goa campus, india. We employ both random forests and lstm networks (more precisely cudnnlstm) as training methodologies to analyse their effectiveness in forecasting out- of-sample directional movements of constituent stocks of the s&p 500 from january 1993 till december 2018 for intraday trading. We introduce a multi-feature setting consisting not only of the returns with respect to the closing prices, but also with respect to the opening prices and intraday returns. As trading strategy, we use krauss et al. (2017) and fischer & krauss (2018) as benchmark and, on each trading day, buy the 10 stocks with the highest probability and sell short the 10 stocks with the lowest probability to outperform the market in terms of intraday returns – all with equal monetary weight. Our empirical results show that the multi-feature setting provides a daily return, prior to transaction costs, of 0.64% using lstm networks, and 0.54% using random forests. Hence, we outperform the single- feature setting in fischer & krauss (2018) and krauss et al. (2017) consisting only of the daily returns with respect to the closing prices, having corresponding daily returns of 0 .41% and of 0 .39% with respect to lstm and random forests, respectively. 1 keywords: random forest, lstm, forecasting, statistical arbitrage, machine learning, intraday trading.[10][18]

2.2.11 A Deep Reinforcement Learning Library For Automated Stock Trading In Quantitative Finance

The research work done by xiao-yang liu1 hongyang yang,qian chen4,runjia zhangliuqing yang bowen xiao christina dan wang electrical engineering, 2department of statistics, 3computer science, columbia university, 3ai4finance llc., usa, ion media networks, usa, department of computing, imperial college, 6new york university (shanghai). As deep reinforcement learning (drl) has been recognized as an effective approach in quantitative finance, getting hands-on experiences is attractive to beginners. However, to train a practical drl trading agent that decides where to trade, at what price, and what quantity involves error-prone and arduous development and debugging. In this paper, we introduce a drl library finrl that facilitates beginners to expose themselves to quantitative finance and to develop their own stock trading strategies. Along with easily-reproducible tutorials, finrl library allows users to streamline their own developments and to compare with existing schemes easily.[11][22]

Chapter 3
METHODOLOGY

3. METHODOLOGY

3.1 LONG–SHORT TERM MEMORY MODULE

Data Collection Module: This module is responsible for collecting the historical stock data from sources like yfinance, Google Finance, Alpha Vantage, etc. The module should be designed to handle data from different sources and store it in a structured format.

Data Preprocessing Module: The collected data is rarely clean and consistent. This module cleans, preprocesses, and transforms the raw data into a format that can be used for training the LSTM model. The preprocessing techniques include data normalization, outlier removal, missing value imputation, feature scaling, etc.

Feature Engineering Module: Feature engineering is the process of creating new features or selecting the most relevant features from the dataset that can improve the accuracy of the LSTM model. Some popular feature engineering techniques include PCA, t-SNE, Fourier Transforms, etc.

LSTM Model Building Module: The LSTM Model Building module is the most important module of the system. It defines the architecture of the LSTM model, sets the hyperparameters, trains the model, and saves the model weights.

Model Evaluation Module: Once the LSTM model is trained, it is necessary to evaluate its performance to know how well it performs on unseen data. This module is responsible for evaluating the model's performance using different evaluation metrics like Mean Squared Error (MSE), Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), R-squared (R2), etc.

Prediction Module: The prediction module uses the trained LSTM model to make predictions on the test dataset. The input to this module is the test dataset, and the output is the predicted values of the stock prices.

Visualization Module: This module is responsible for visualizing the predicted values and the actual values on a graph. It uses libraries like Matplotlib and Seaborn to plot the actual stock prices and the predicted stock prices on a time-series graph.

Deployment Module: This module is responsible for deploying the LSTM model as a web application using frameworks like Flask, Django, or Streamlit. The module should ensure that the application is scalable, robust, and user-friendly. It should also provide APIs to access the predicted values programmatically.

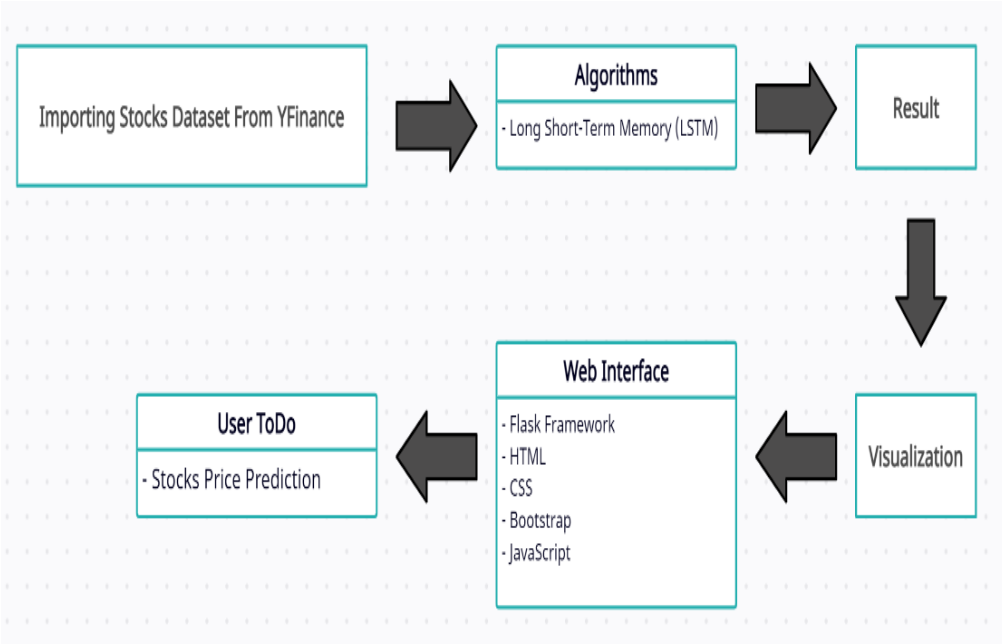


Fig 3.1: Flowchart of Implementation

3.2 DATA PRE-PROCESSING

Data pre-processing is a process of preparing the raw data and making it suitable for a machine learning model. It is the first and crucial step while creating a machine learning model.

When creating a machine learning project, it is not always a case that we come across the clean and formatted data. And while doing any operation with data, it is mandatory to clean it and put in a formatted way. So, for this, we use data pre-processing task.

A real-world data generally contains noises, missing values, and maybe in an unusable format which cannot be directly used for machine learning models. Data pre-processing is required tasks for cleaning the data and making it suitable for a machine learning model which also increases the accuracy and efficiency of a machine learning model.

It involves below steps:

1. Importing Libraries
2. Importing Dataset
3. Splitting data into Test and Training dataset
4. Feature Scaling

3.2.1 Importing Libraries

In order to perform data pre-processing using Python, we need to import some predefined Python libraries. These libraries are used to perform some specific jobs. There are three specific libraries that we will use for data pre-processing, which are:

NumPy: NumPy Python library is used for including any type of mathematical operation in the code. It is the fundamental package for scientific calculation in Python. It also supports to add large, multidimensional arrays and matrices.

Matplotlib: The second library is **matplotlib**, which is a Python 2D plotting library, and with this library, we need to import a sub-library **pyplot**. This library is used to plot any type of charts in Python for the code.

Pandas: The last library is the Pandas library, which is one of the most famous Python libraries and used for importing and managing the datasets. It is an open-source data manipulation and analysis library.

```
# importing libraries
import numpy as nm
import matplotlib.pyplot as mtp
import pandas as pd
```

Fig 3.2.1: Importing Libraries

3.2.2 Importing Dataset

Import the datasets which we have collected for our machine learning project. But before importing a dataset, we need to set the current directory as a working directory. To set a working directory in Spyder IDE, we need to follow the below steps:

- Save your Python file in the directory which contains dataset.
- Go to File explorer option in Spyder IDE, and select the required directory.
- Click on F5 button or run option to execute the file.

3.2.3 Splitting Dataset into Test and Training Dataset

In machine learning data pre-processing, we divide our dataset into a training set and test set. We are using 80% of data for training and 20% for testing. This is one of the crucial steps of data pre-processing as by doing this, we can enhance the performance of our machine learning model.

If we have given training to our machine learning model by a dataset and we test it by a completely different dataset. Then, it will create difficulties for our model to understand the correlations between the models.

If we train our model very well and its training accuracy is also very high, but we provide a new dataset to it, then it will decrease the performance. So, we always try to make a machine learning model which performs well with the training set and also with the test dataset. Here, we can define these datasets as:

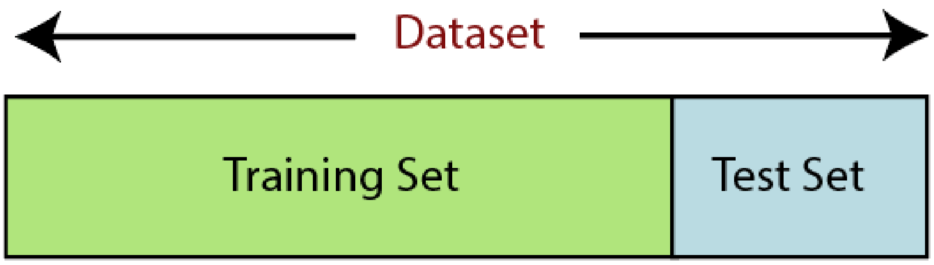


Fig 3.2.3 Splitting of Dataset

Training Set: A subset of dataset to train the machine learning model, and we already know the output.

Test set: A subset of dataset to test the machine learning model, and by using the test set, model predicts the output.

3.2.4 Feature Scaling

Feature scaling is the final step of data preprocessing in machine learning. It is a technique to standardize the independent variables of the dataset in a specific range. In feature scaling, we put our variables in the same range and in the same scale so that no any variable dominates the other variable.

3.2.5 Long Short-Term Memory Algorithm

Algorithm: Stock price prediction using LSTM algorithm

Input : Historic stock data

Output:Prediction of stock price using price variation

Step 1 : Start.

Step 2 : Data Pre-processing after getting the historic data from the market for a particular share.

Step 3 : Import the dataset to the data structure and read the open price.

Step 4: Do a feature scaling on the data so that the data values will vary from 0 and 1.

Step 5: Creating a data structure with 60 timestamps and 1 output.

Step 6 : Building the RNN (Recurrent neural network) for Step 5 data set and Initialize the RNN by using sequential repressor.

3.3 RANDOM FOREST

Random Forest is a popular machine learning algorithm that belongs to the supervised learning technique. It can be used for both Classification and Regression problems in ML. It is based on the concept of ensemble learning**,** which is a process of combining multiple classifiers to solve a complex problem and to improve the performance of the model.

As the name suggests, "Random Forest is a classifier that contains a number of decision trees on various subsets of the given dataset and takes the average to improve the predictive accuracy of that dataset**."** Instead of relying on one decision tree, the random forest takes the prediction from each tree and based on the majority votes of predictions, and it predicts the final output.

- RF is capable of performing both Classification and Regression tasks.
- It is capable of handling large datasets with high dimensionality.
- It enhances the accuracy of the model and prevents the overfitting issue

Implementation Steps are given below:

- Data Pre-processing step
- Fitting the Random Forest algorithm to the Training set
- Predicting the test result
- Test accuracy of the result (Creation of Confusion matrix)
- Visualizing the test set result.

3.3.1 Random Forest Algorithm

The Working process can be explained in the below steps

Step-1: Select random K data points from the training set.

Step-2: Build the decision trees associated with the selected data points (Subsets).

Step-3: Choose the number N for decision trees that you want to build.

Step-4: Repeat Step 1 & 2.

Step-5: For new data points, find the predictions of each decision tree, and assign the new data points to the category that wins the majority votes.

Chapter 4

SYSTEM DESIGN AND ANALYSIS

4. SYSTEM DESIGN AND ANALYSIS

The prediction methods can be roughly divided into two categories, statistical methods and artificial intelligence methods. Statistical methods include logistic regression model, ARCH model, etc. Artificial intelligence methods include multi-layer perceptron, convolutional neural network, naive Bayes network, back propagation network, single-layer LSTM, support vector machine, recurrent neural network, etc. They used Long short-term memory network (LSTM).

4.1 LONG SHORT-TERM MEMORY NETWORK ARCHITECTURE:

Long short-term memory network (LSTM) is a particular form of recurrent neural network (RNN).

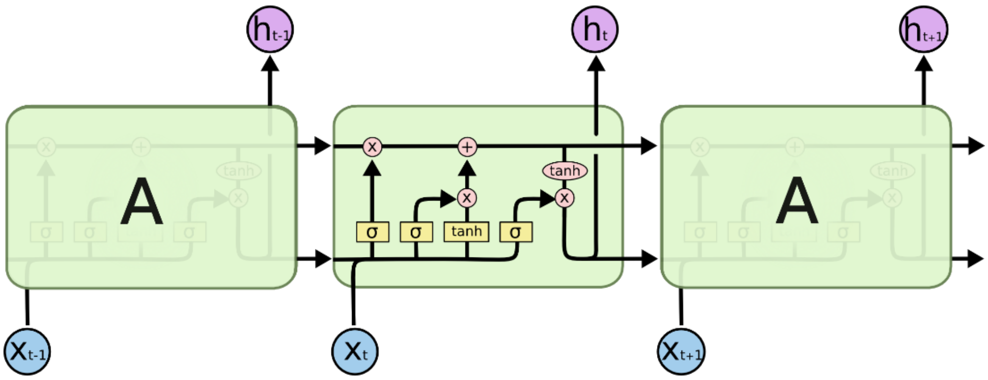


Fig. 4.1 Architecture of LSTM

4.1.1 Working of LSTM:

LSTM is a special network structure with three “gate” structures.

Three gates are placed in an LSTM unit, called input gate, forgetting gate and output gate. While information enters the LSTM’s network, it can be selected by rules. Only the information conforms to the algorithm will be left, and the information that does not conform will be forgotten through the forgetting gate. The experimental data in this paper are the actual historical data downloaded from the yahoo finance. Three data sets were used in the experiments. It is needed to find an optimization algorithm that requires less resources and has faster convergence speed.

- LSTM is used instead of RNN to avoid exploding and vanishing gradients.
- Used Long Short-term Memory (LSTM) with embedded layer and the LSTM neural network with automatic encoder.
- In this project python is used to train the model, MATLAB is used to reduce dimensions of the input. MySQL is used as a dataset to store and retrieve data.
- The historical stock data table contains the information of opening price, the highest price, lowest price, closing price, transaction date, volume and so on.
- The accuracy of this LSTM model used in this project is 75%.

The proposed system utilizes the power of machine learning algorithms to predict future stock prices based on historical data. Specifically, we use a Long Short-Term Memory (LSTM) neural network to learn the patterns and trends in the historical stock prices and make predictions for the future. The proposed system is automated and can quickly adapt to changes in the market. It is also more accurate than the existing system as it can analyze large amounts of data and make predictions based on statistical models. The proposed system also includes a web application that allows users to access the predicted stock prices and make informed decisions about their investments.

Forget Gate:

A forget gate is responsible for removing information from the cell state. The information that is no longer required for the LSTM to understand things or the information that is of less importance is removed via multiplication of a filter.

- This is required for optimizing the performance of the LSTM network.
- This gate takes in two inputs; h_t-1 and x_t. h_t-1 is the hidden state from the previous cell or the output of the previous cell and x_t is the input at that particular time step.

Input Gate:

1. Regulating what values need to be added to the cell state by involving a sigmoid function. This is basically very similar to the forget gate and acts as a filter for all the information from hi-1 and x_t.

2. Creating a vector containing all possible values that can be added (as perceived from h_t-1 and x_t) to the cell state. This is done using the tanh function, which outputs values from -1 to +1.
3. Multiplying the value of the regulatory filter (the sigmoid gate) to the created vector (the tanh function) and then adding this useful information to the cell state via addition operation.

Output Gate:

The functioning of an output gate can again be broken down to three steps:

- Creating a vector after applying tanh function to the cell state, thereby scaling the values to the range -1 to +1.
- Making a filter using the values of h_t-1 and x_t, such that it can regulate the values that need to be output from the vector created above. This filter again employs a sigmoid function.
- Multiplying the value of this regulatory filter to the vector created in step 1, and sending it out as a output and also to the hidden state of the next cell.

4.2 STRUCTURE CHART

A structure chart (SC) in software engineering and organizational theory is a chart which shows the breakdown of a system to its lowest manageable levels. They are used in structured programming to arrange program modules into a tree. Each module is represented by a box, which contains the module's name.

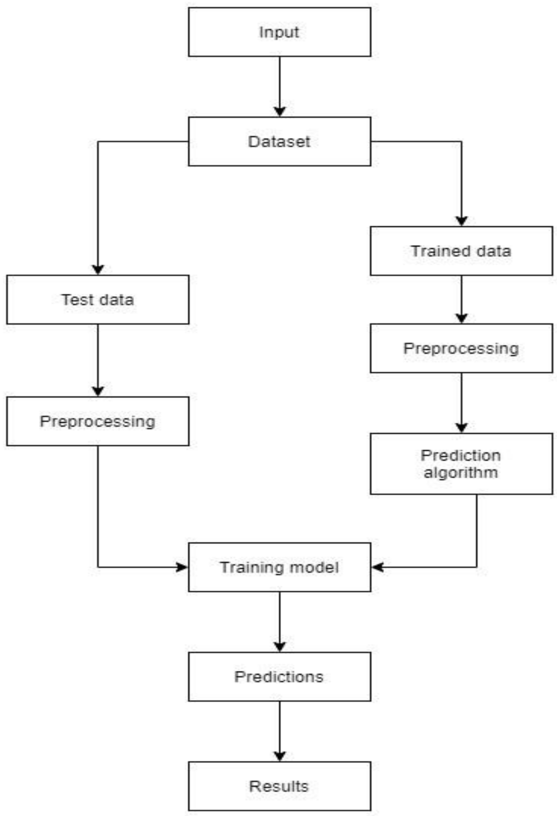


Fig. 4.2: Training and prediction

4.3 UML DIAGRAMS

A UML diagram is a partial graphical representation (view) of a model of a system under design, implementation, or already in existence. UML diagram contains graphical elements (symbols) - UML nodes connected with edges (also known as paths or flows) - that represent elements in the UML model of the designed system. The UML model of the system might also contain other documentation such as use cases written as templated texts.

The kind of the diagram is defined by the primary graphical symbols shown on the diagram. For example, a diagram where the primary symbols in the contents area are classes is class diagram. A diagram which shows use cases and actors is use case diagram. A sequence diagram shows sequence of message exchanges between lifelines. UML specification does not preclude mixing of different kinds of diagrams, e.g., to combine structural and behavioral elements to show a state machine nested inside a use case. Consequently, the boundaries between the various kinds of diagrams are not strictly enforced. At the same time, some UML Tools do restrict set of available graphical elements which could be used when working on specific type of diagram.

Structure diagrams show the static structure of the system and its parts on different abstraction and implementation levels and how they are related to each other. The elements in a structure diagram represent the meaningful concepts of a system, and may include abstract, real world and implementation concepts. Behavior diagrams show the dynamic behavior of the objects in a system, which can be described as a series of changes to the system over time.

4.3.1 Use Case Diagram

In the Unified Modelling Language (UML), a use case diagram can summarize the details of your system's users (also known as actors) and their interactions with the system. To build one, you'll use a set of specialized symbols and connectors. An effective use case diagram can help your team discuss and represent:

- Scenarios in which your system or application interacts with people, organizations, or external systems.
- Goals that your system or application helps those entities (known as actors) achieve.
- The scope of your system.

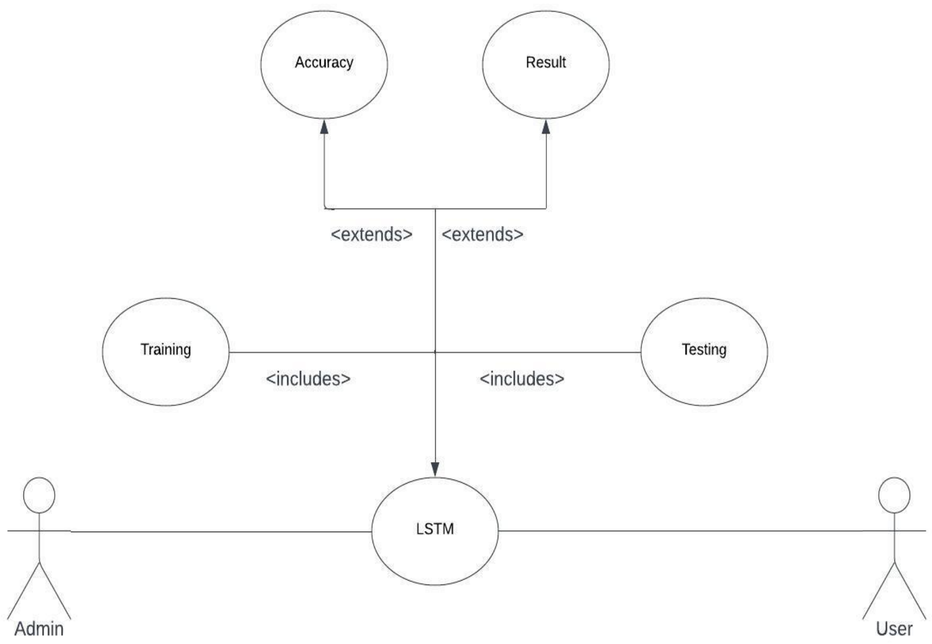


Fig.4.3.1: Use Case Diagram

4.3.2 Sequence Diagram

A sequence diagram is a type of interaction diagram because it describes how and in what order a group of objects works together. These diagrams are used by software developers and business professionals to understand requirements for a new system or to document an existing process. Sequence diagrams are sometimes known as event diagrams or event scenarios. Sequence diagrams can be useful references for businesses and other organizations. Try drawing a sequence diagram to:

- Represent the details of a UML use case.
- Model the logic of a sophisticated procedure, function, or operation.
- See how objects and components interact with each other to complete a process.
- Plan and understand the detailed functionality of an existing or future scenario.

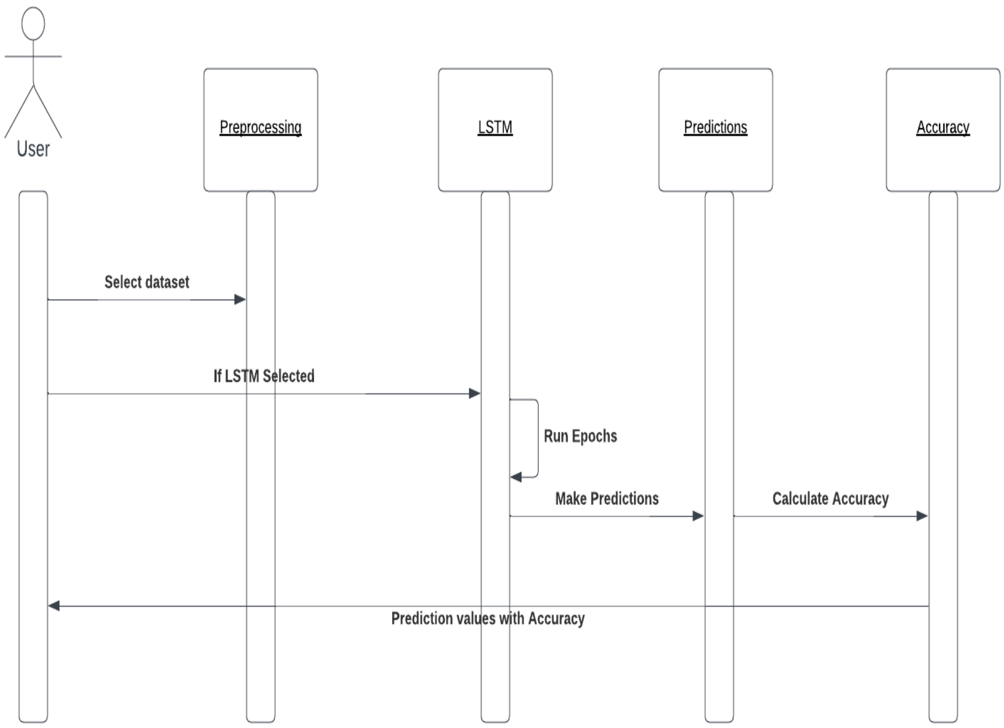


Fig. 4.3.2: Sequence Diagram

4.3.3 Activity Diagram

An activity diagram is a behavioral diagram i.e. it depicts the behavior of a system. An activity diagram portrays the control flow from a start point to a finish point showing the various decision paths that exist while the activity is being executed.

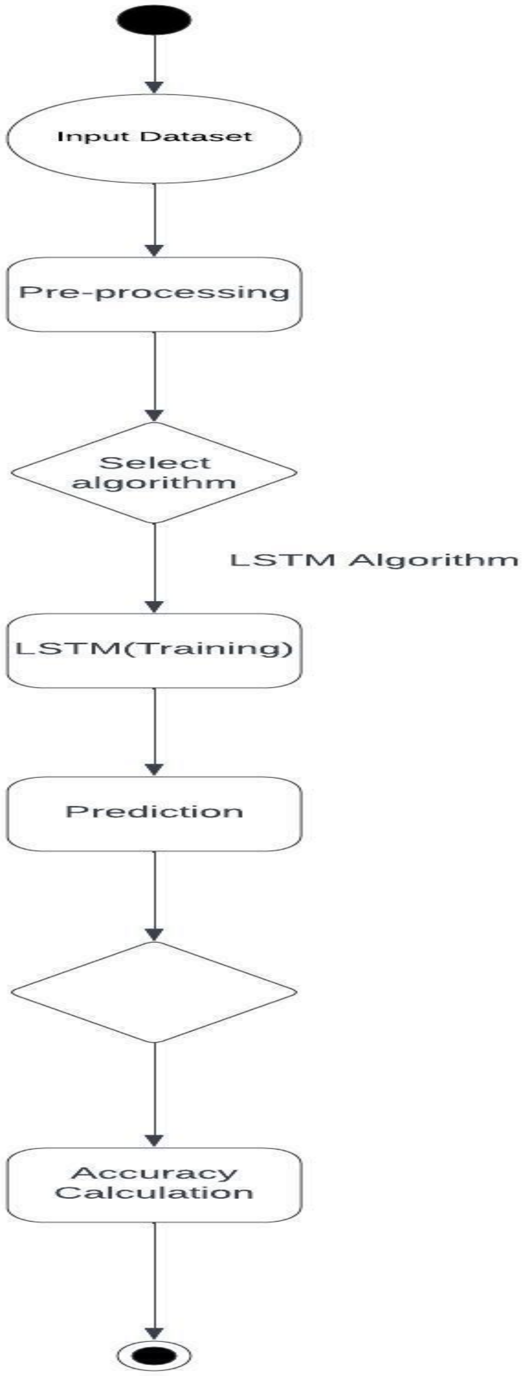


Fig.4.3.3: Activity Diagram

4.3.4 Collaboration Diagram

Collaboration diagrams are used to show how objects interact to perform the behavior of a particular use case, or a part of a use case. Along with sequence diagrams, collaboration is used by designers to define and clarify the roles of the objects that perform a particular flow of events of a use case. They are the primary source of information used to determining class responsibilities and interfaces.

The collaborations are used when it is essential to depict the relationship between the object. Both the sequence and collaboration diagrams represent the same information, but the way of portraying it quite different. The collaboration diagrams are best suited for analyzing use cases.

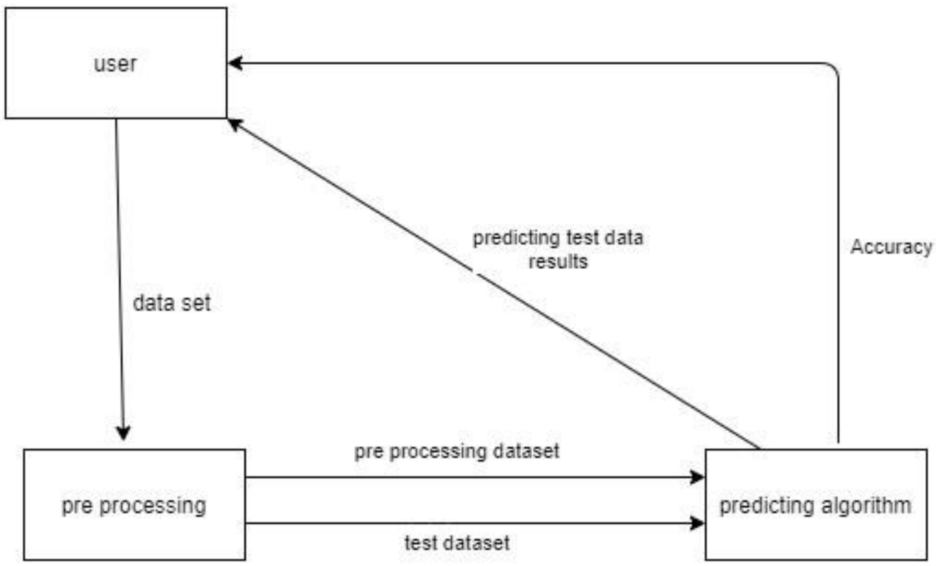


Fig.4.3.4: Data transfer between modules

4.3.5 Flow Chart

A flowchart is a type of diagram that represents a workflow or process. A flowchart can also be defined as a diagrammatic representation of an algorithm, a step-by-step approach to solving a task. The flowchart shows the steps as boxes of various kinds, and their order by connecting the boxes with arrows.

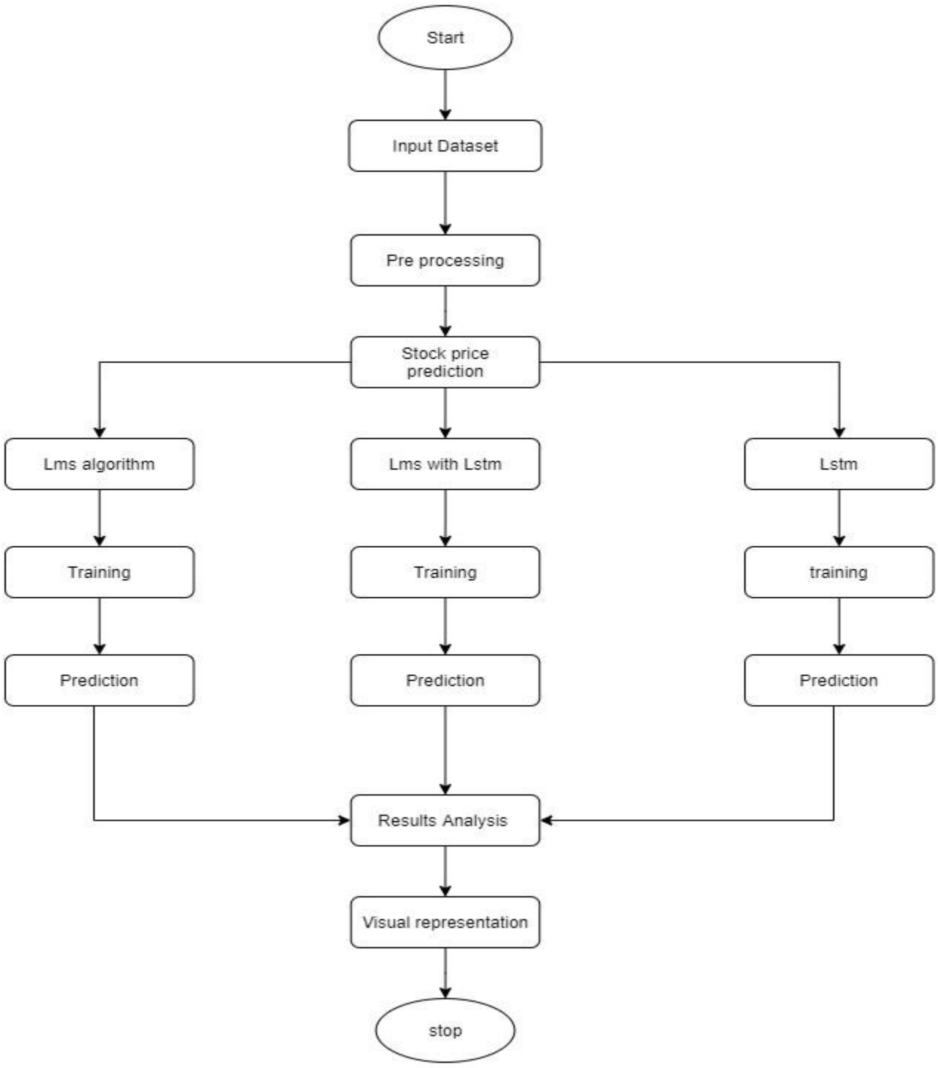


Fig.4.3.5: Flow of execution

4.4 SYSTEM REQUIREMENTS

4.4.1 Functional Requirements

- The system should be able to collect stock data from yfinance.
- The system should be able to process the stock data using LSTM to predict stock prices for the next 30 days.
- The system should be able to display the predicted stock prices on the web application.
- The system should be able to handle multiple users accessing the web application simultaneously.

- The system should provide a user-friendly interface for users to input stock data and view predictions.
- The system should be able to handle errors gracefully and provide appropriate error messages.

4.4.2 Non-Functional Requirements

- The system should have a high level of accuracy in predicting stock prices.
- The system should have a low latency in processing stock data and providing predictions.
- The system should be able to handle a large volume of data.
- The system should be secure and protect user data.
- The system should have a high level of availability, with minimal downtime.
- The system should be scalable, allowing for future growth and expansion.

4.4.3 Software Requirements

- Python 3.x
- Flask web framework
- TensorFlow library
- NumPy library
- Pandas library
- Scikit-learn library
- Bootstrap CSS framework
- jQuery library

4.4.4 Hardware Requirements

- A computer with a minimum of 4GB RAM and a multi-core processor.
- Adequate storage space for storing historical stock data and the web application files.
- An internet connection for accessing yfinance and for users to access the web application.

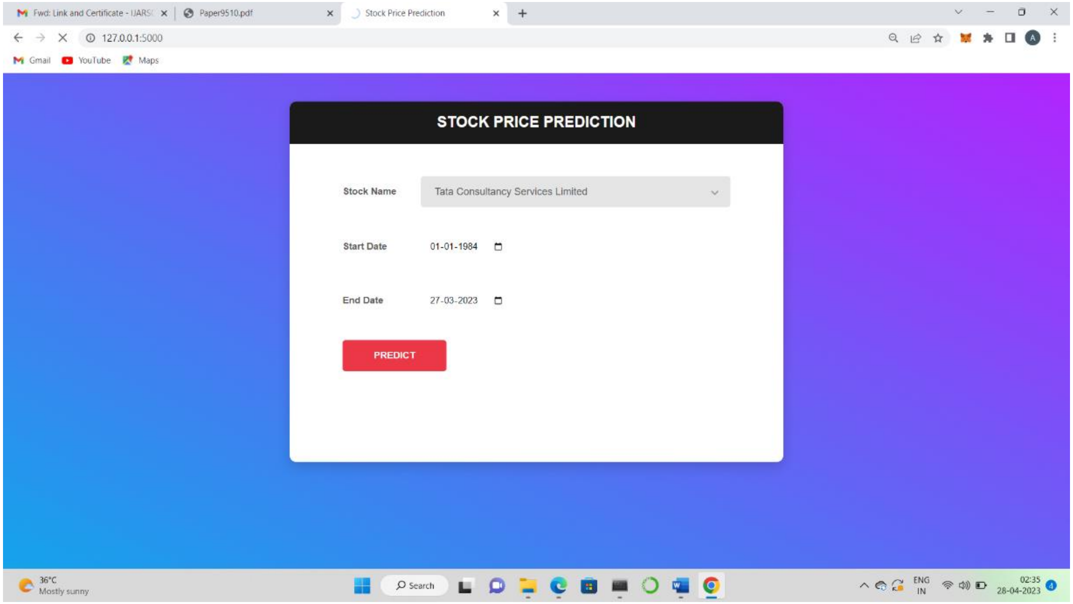
Chapter 5

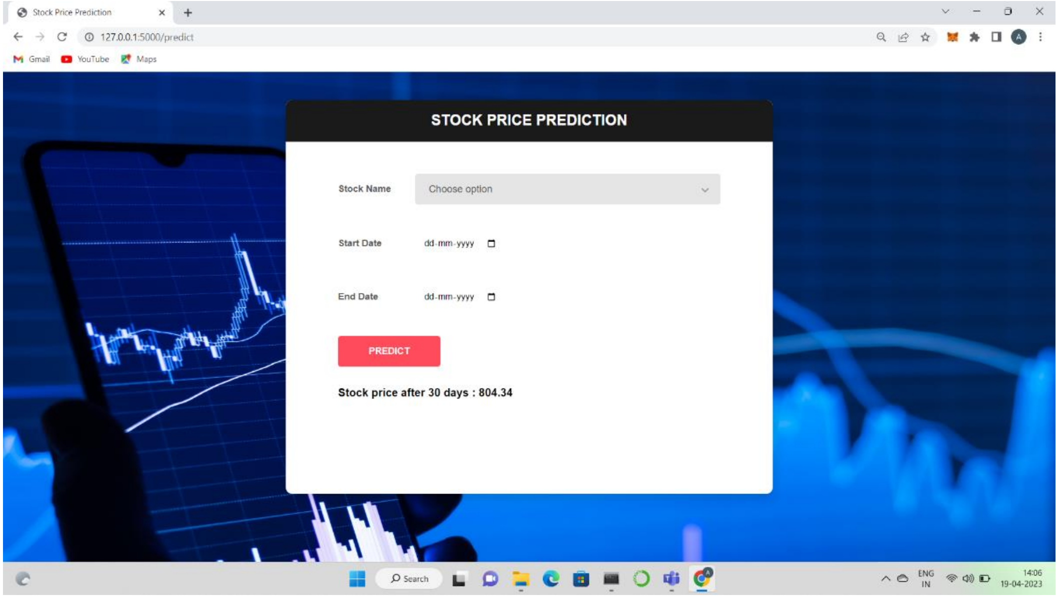
RESULT

5. RESULT

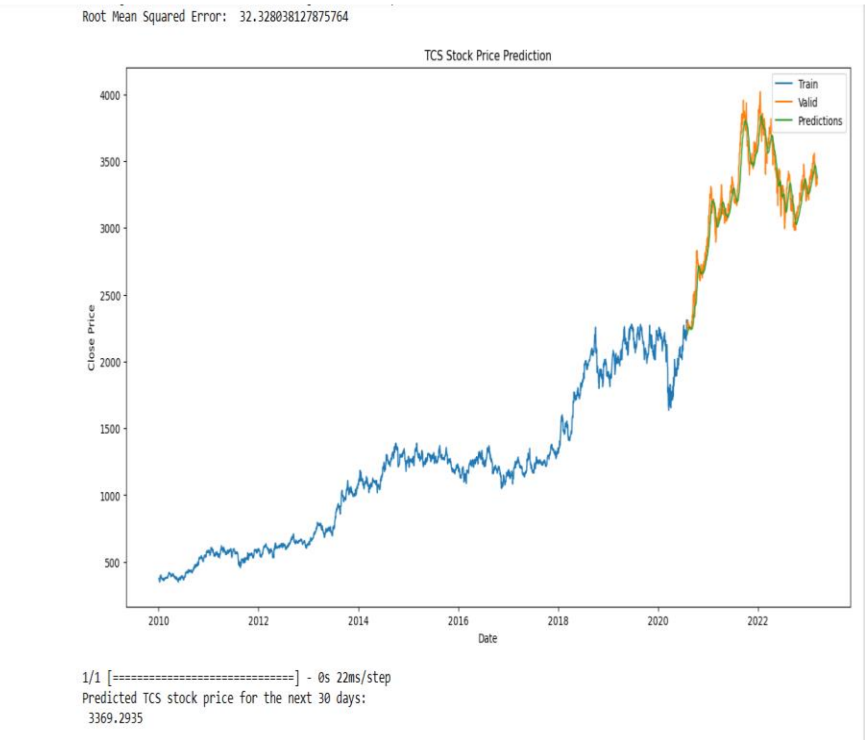
In this project, we are predicting closing stock price of any given organization, we developed a web application for predicting close stock price using LSTM algorithms for prediction. We have applied datasets belonging to TCS, HDFC Limited, Infosys Limited, Bharti Airtel Limited, ITC Limited, ICICI Bank Limited, Nestle Limited and Reliance Industries Stocks and achieved above 91% accuracy for these datasets.

5.1 WEBSITE PAGE





5.2 PREDICTED VALUE GRAPH



Chapter 6

FUTURE SCOPE

6. FUTURE SCOPE

- We want to extend this application for predicting cryptocurrency trading.
- We want to add sentiment analysis for better analysis.

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