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A Study on Stock Price Prediction using LSTM Model

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Abstract: ***Predicting stock price of any stock is a challenging task because the Volatility of stock market the nature of stock price is dynamic, chaotic, noisy and sometimes totally unexpected. The other most difficult task is to analyze and decide financial time series data that improves investment returns and help in minimizing losses. Technical analysis is a method that help in analyzing a stock and predict its future price via evaluating securities. There are already many Indicators and other tools for technical analysis in stock market. Some famous indicators such as SMA (Simple Moving Average), EMA (Exponential Moving Average), WMA (Weight Moving Average), VWMA (Volume Weight Moving Average), DEMA (moving averages), MACD (Moving Average Convergence/Divergence), ADX (Average Di- reactional Movement Index), TDI (Trend Detection Index), Arun, VHF (trend indicators), stochastic, RSI (Relative Strength Index), SMI(Stochastic Momentum Index, volume indicators are also available for technical analysis. Here, we have used the LSTM Model to predict future price of some big companies of stock market in NSE.***
Keywords: Technical analysis, LSTM Model, Neural Net- work, Last Price, RNN, MACD, ADX, TDI, RSI, MA

I. INTRODUCTION

Stock market trend prediction is the act of determining the future value of a stock traded on an exchange. A successful success is profitable. Prediction methods fall into two categories. They are native. Fundamental analysis relates to the company that outlines the stock itself. They evaluate the company's past performance as well as the reliability of its accounts. Several performance ratios are created that help the fundamental analyst assess the stock's validity, such as the P/ E ratio.

Technical analysts or chartists are not concerned with any of the company's fundamentals. The fundamental analysis helps in long term investment than short term. The technical analysis is preferred for short term analysis using the evaluation of securities/assets using statistical indicators generated on the basis of market behavior, price, volume, company's market capitalization. Technical analysis is more based on human behavior and prospective towards a company. The technical analysis paradigm is thus that there is an inherent correlation between price and company that can be used to determine when to enter and exit the market.

With the technology world, the analysis is become easier than before. Today you will get all the data you need to analysis a company on a single platform one click away. In re- cent times, many financial analysts and stock market investors seem convinced that they can make profits by employing one technical analysis approach or another to predict stock market by data mining approach. Some of the functionalities of data mining are the discovery of concept or class descriptions, classification, associations and correlations, clustering, prediction, outlier and deviation analysis and similarity analysis. Data classification can be done by many methods like LSTM Model, rough set approach and artificial neural network have been applied to this domain. A LSTM Model is a graph that uses a neural network architecture method to illustrate every possible outcome of a decision. Our mission is to create an algorithm which give results on a single variable using multiple variables. This rule-based forecasting model receive major technical indicators as an input and to predict trend of share-price either in upward direction or downward direction.

Technical analysis is a trading tool used to evaluate securities and attempt to predict future changes by analyzing statistical data collected from trading activities (such as price changes and trading volume). Based on the assumptions of technical analysis, price fluctuations and quantities essentially contain certain patterns over a period of time. Data mining technology will also be used to discover these patterns in an automated way, and the subsequently discovered patterns can predict future trends in stock prices. In this research, we are using some big companies' previous data, combined with 22 technical indicators based on OHLCV historical data, to help investors establish decision-making when buying and selling.

II. METHODOLOGY

Various types of neural networks can be developed. The combination of different factors such as network topology, training methods etc. For this experiment, we have considered to be a recurrent neural network and long-term short-term memory.

In this section we will discuss the systematic approach. Our system includes the following stages:

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A. Stage 1: Raw Data

At this stage, collect historical stock data from https://www.quandl.com/data/NSE, and use this historical data to predict future stock prices.

B. Stage 2: Data Preprocessing

The preprocessing stage includes:

1) Data Discretization: part of data reduction, but especially important for digital data

2) Data Conversion: normalization.

3) Data Cleaning: fill in missing values.

4) Data Integration: integration of data files.

After the data set is converted into a clean data set, the data set is divided into a training set and a test set for evaluation. Here, the training value is taken as the most recent value. The test data is retained as 5-10% of the total data set.

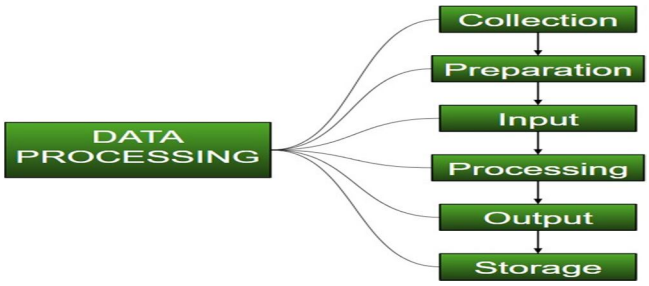


Fig. 1. RMSE Model Data Graph

C. Stage 3: Feature Extraction

In this layer, only the features to be fed to the neural network are selected. We will select functions from "Date", "Open", "High", "Low", "Close" and "Trading Volume".

D. Stage 4: Training Neural Network

At this stage, the data is fed to the neural network and trained to make predictions, thereby assigning random deviations and weights. Our LSTM model consists of a sequential input layer, followed by 2 LSTM layers and a dense layer with ReLU activation, and finally a dense output layer with linear activation function.

E. Stage 5: Output Generation

In this layer, the output value generated by the output layer of the RNN is compared with the target value. The error or difference between the target value and the obtained output value can be minimized by using a back propagation algo- rithm, which can adjust the weight and bias of the network.

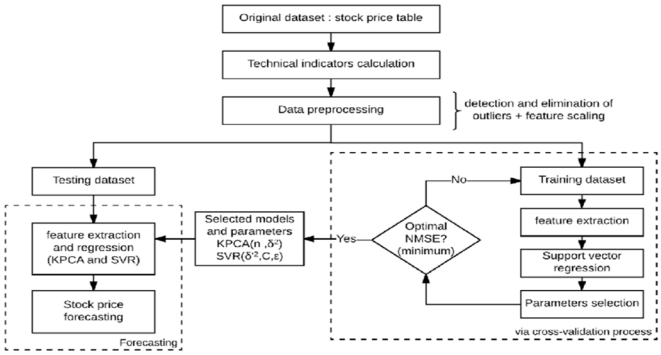


Fig. 2. Data Processing with RNN

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III. ANALYSIS

To analyze the efficiency of the system, we use the root mean square error (RMSE). By using the RMSE value, the error or difference between the target value and the obtained output value can be minimized. RMSE is the average of the squares of all errors/square root of the average. The use of RMSE is very common, and it provides an excellent general error metric for numerical prediction. Compared with similar average absolute errors, RMSE amplifies and severely penalizes larger errors.

$$RMSE = \sqrt{\sum_{i=1}^{n} \frac{(\hat{y}_i - y_i)^2}{n}}$$

Fig. 3. RMSE Model Formula

The root mean square error uses the difference between each observed value and the predicted value. You can swap the order of subtraction because the next step is to square the difference. This is because the square of a negative value is always a positive value.

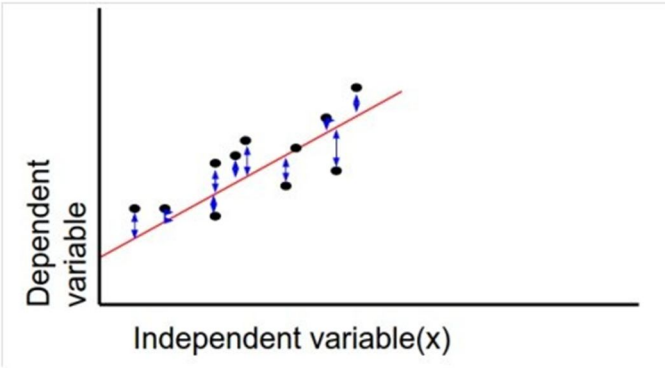


Fig. 4. RMSE Model Data Graph

RMSE quantifies the different degrees of a set of values. The smaller the RMSE value, the closer the predicted value and the observed value.

IV. EXPERIMENTAL WORK

A. Data Set Description

We got the data from https://w ww.quandl.com. We collected historical stock data from the National Stock Exchange and New York Stock Exchange. Wecollected daily data sets and kept the window size as 100 days.

B. Sequence Data

We got 1324 sequences. From these data sets we used 1201 samples for training purposes and 123 samples for validation purpose.

C. Training Details

To train the model, we use neural network and normalize each vector order. We use Jupyter for training Platform [Machine Type: n1-standard-2 (2 vCPUs, 7.5 GB Memory), CPU platform: Intel] and use Windows 10, TensorFlow and Tiingo (Back-end) as a learning environment. We are using RMSE Model for analysis purpose.

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V. EXPERIMENTAL RESULTS

Every Stock has different data and price movement, so their sensitivity also behaves in same way. After analyzing the LSTM Model algorithm on different stocks, we had found different accuracy and sensitivity in each of them but it always closes to 70% and 80% in accuracy and sensitivity respectively.

Table 1: Classification Accuracy, Model, Sensitivity

Stock Name	Algorithm	Accuracy	Sensitivity
Tata Motors	LSTM	.7568	.8569
Facebook	LSTM	.7456	.8632
Google	LSTM	.7896	.8456
Microsoft	LSTM	.7852	.8745

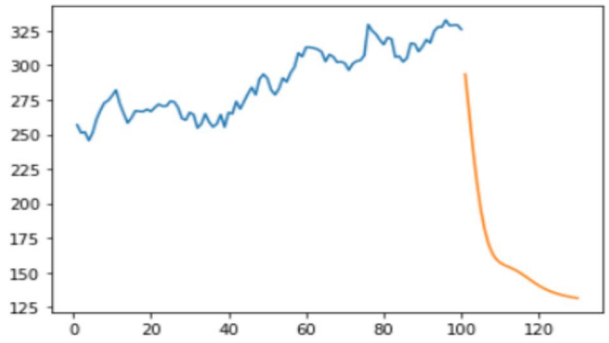


Figure 1: Open/Low/High/Close on Facebook

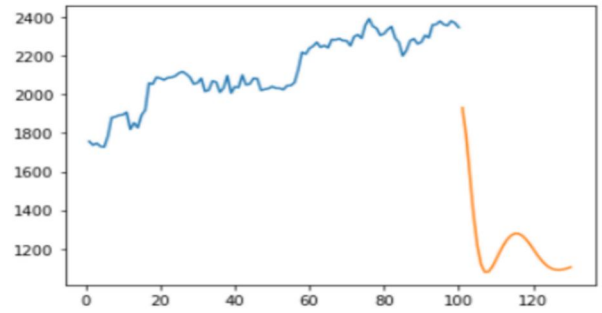


Figure 2: Open/Low/High/Close on Google

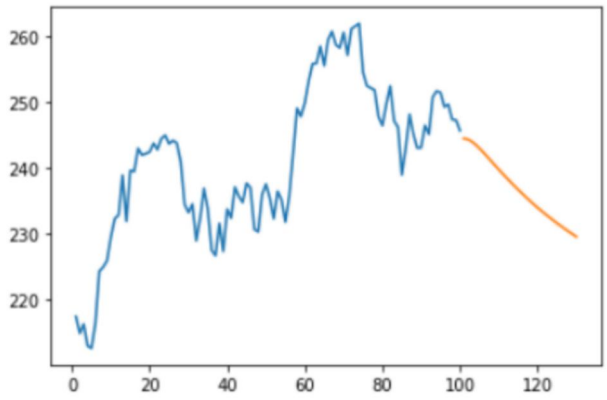


Figure 3: Open/Low/High/Close on Microsoft

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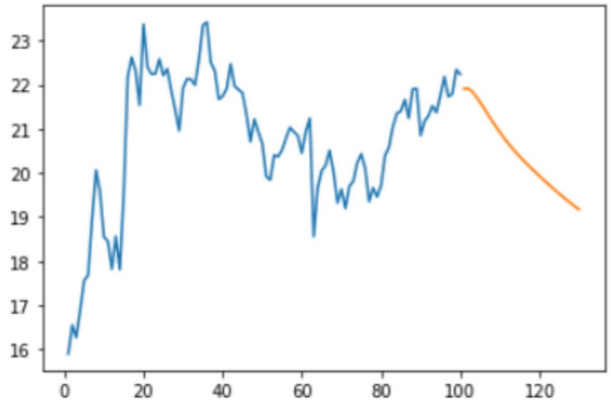


Figure 4: Open/Low/High/Close on Tata Motors

VI. CONCLUSION

The popularity of stock market trading is growing rapidly. This encourages researchers to find new ways, new technology to make predictions. Prediction Technology can not only help researchers, it can also help investors and anyone dealing with stocks market. To help predict stock indexes, a predictive model with high accuracy is required.

In this work, we used one of the most precise Prediction techniques using recurrent neural networks and the long-term short-term memory unit to help investors, Analyst or anyone interested in investing in stocks to market by providing them with a good understanding of the future situation in the stock market.

VII. FUTURE & SCOPE

Stock market forecasting is an attempt to determine the future value of company stocks or other financial instruments traded on exchanges. Successfully predicting the future price of stocks may generate considerable profits. A Stock Price Predictor is part of technology which will be developed as needs of future users and stock market. Data and share holders' behavior will always play most important role in more accurate price prediction.

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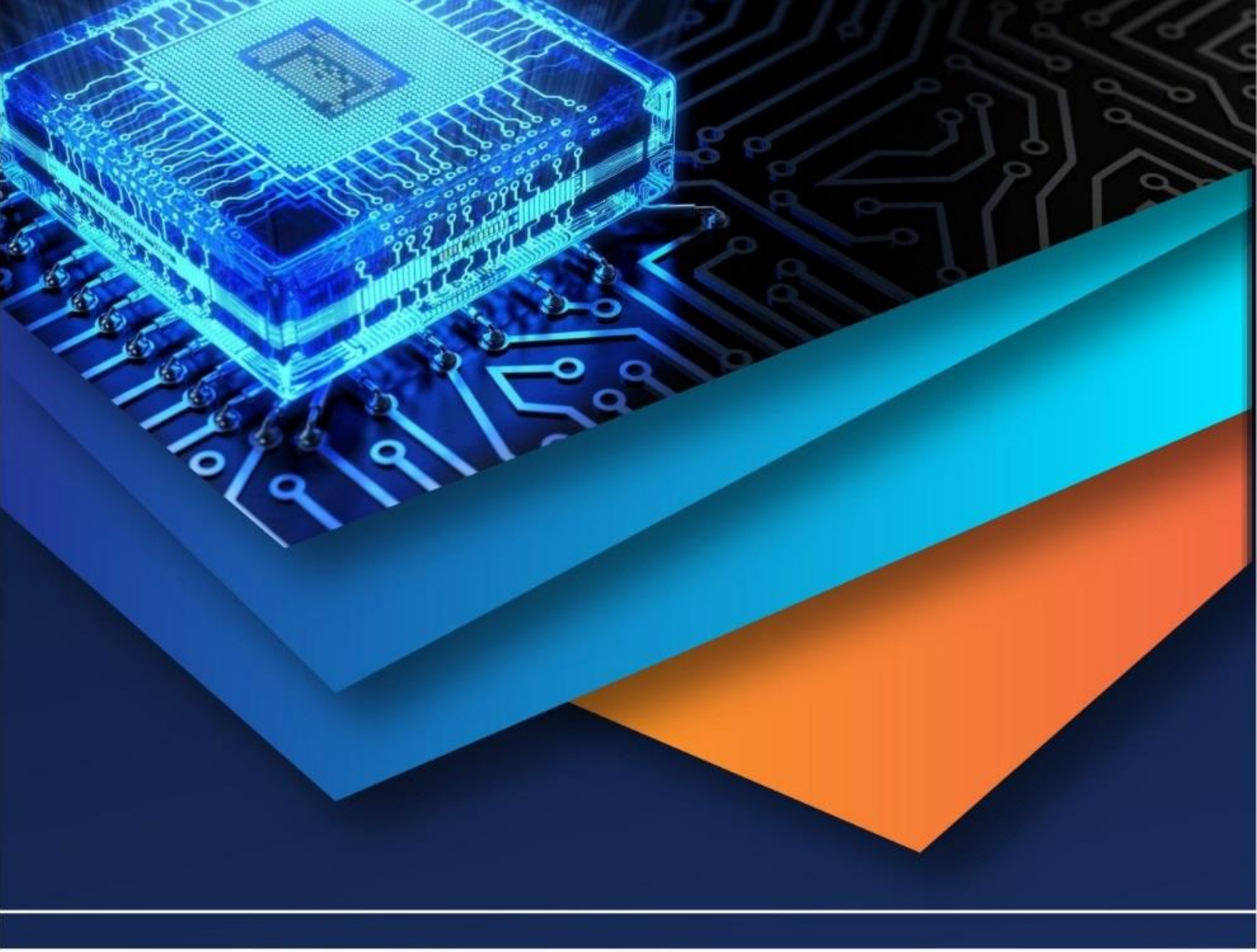
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