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Stock Price Prediction

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Abstract: Stock market is a highly volatile place. At the fundamental level, it is said that supply and demand in the market determines stock price. But it tends to not follow any fixed pattern and is also affected by a large number of varying factors. Researchers use input data from various sources and in different forms. Some systems use historical stock data, some use reviews as a factor while some use a hybrid system which takes multiple inputs to predict the market. This method uses only one factor- closing price to predict the future closing prices of the different stocks. We used the Long Short Term Memory network- called "LSTM" for predicting the price.

I. INTRODUCTION

A stock represents the ownership for a fraction of a certain company. This makes the person a owner to a proportion of the company's assets. The profits of the company are then shared among the shareholder according to the percentage of how much stocks they own. The stock market is the collection of markets and exchanges where regular activities of buying, and selling of shares of publicly-held companies takes place regularly. Such financial activities are conducted through institutionalized formal exchanges or through marketplaces which operate under a defined set of regulations.

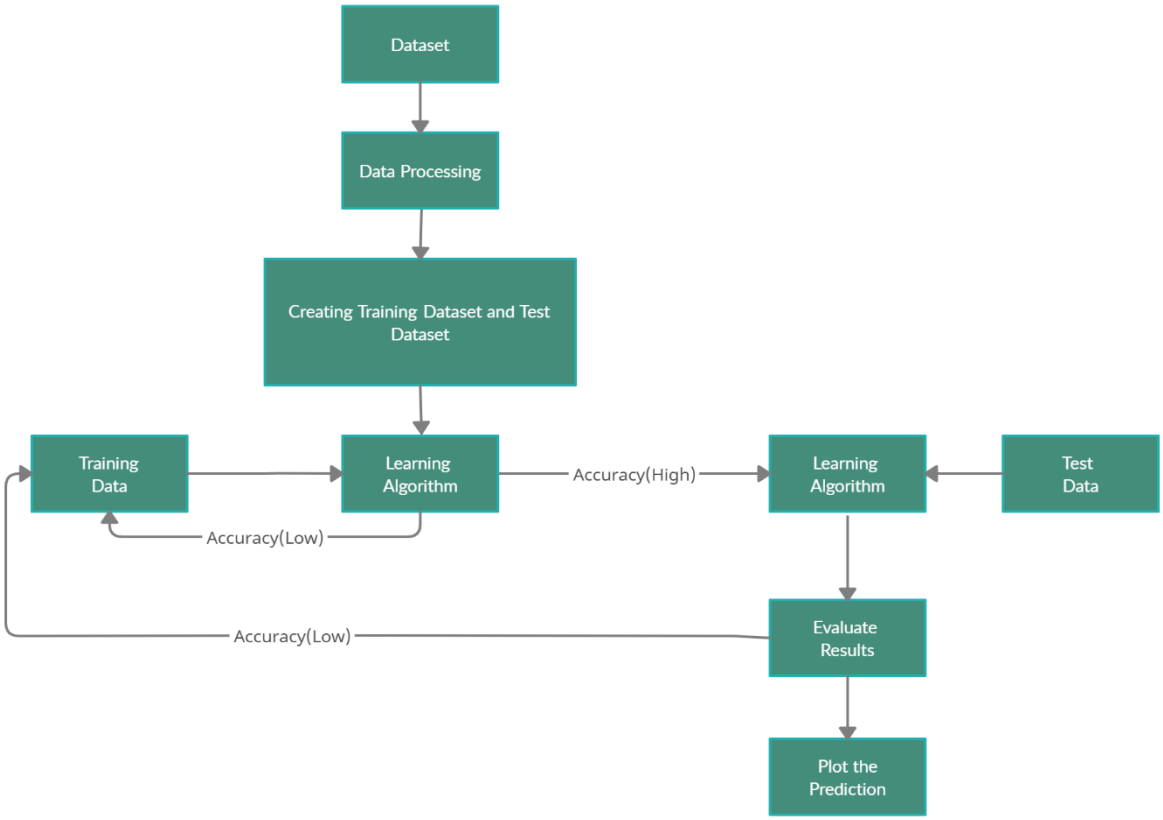
In today's world it is possible to purchase anything online, but there is usually a market for everything. People visit the vegetable markets to purchase vegetables, local stores to buy grocery, local timber market to purchase wood and furniture. A stock market is similar to this, where people are able to buy stocks of different corporations. Since the stock market brings together thousands of market participants who wish to buy and sell shares, it ensures that fair pricing practices are carried out and transparency in transactions is present. While earlier stock markets used to issue and deal in paper-based physical share certificates, nowadays everything is computerized and computer-aided stock markets operate electronically.[1]

If a company wants to issue and sell their shares for the first time, they have to carry out the initial public offerings (IPO). This helps them to raise the required capital from the investors which helps them in future. This means that the company divides a certain amount of its worth into shares and sells a part of those shares to the public at a given price. The IPO is very important part of the process as the investors as able to buy great amount of the shares.

The prediction of a stock market may serve as an early recommendation system for those investors who try to invest for short-term and as an early financial distress warning system for long-term shareholders. Forecasting accuracy is an important factor in selecting any forecasting methods. Research efforts for improving the accuracy of forecasting models have been on aa increase since the last decade. The appropriate selections for choosing which stock will give profits and are suitable for investment is a very difficult task. The most important factor which each investor has on mind is to earn maximum profits on their investments.[2]

Investors all around the world will be familiar with the saying, "buy low, sell high" but this does not provide enough context to make proper investment decisions. Before an investor invests in any stock, one needs to be aware of how the stock market behaves. Investing in a good stock at a bad time can have some disastrous results, while investing in a mediocre stock but at the right time can bear great profits. Financial investors of today are facing this problem of trading as they do not properly understand as to which stocks to buy or which stocks to sell and at what time in order to get the maximum profits. There has been an increase in the number of people investing in stocks but not all of them have the proper knowledge regarding this subject. Predicting long term value of the stock is relatively easier than predicting on a day-to-day basis as the stocks tend to fluctuate rapidly every hour based on the events happening in the world.

This project is targeted towards investors and traders to help them analyse the company stocks and get to know the predicted prices of the stocks based on the past performance of the stock. Generally, there are various factors which affect the prices of the stock such as physical factors, psychological, rational and irrational behaviour, announcements, historical performance etc. This project only takes into consideration the past performance popularly termed as technical analysis and assumes other factors do not make an impact on the stock prices. Currently the system predicts the prices of 5 companies namely Bharti Airtel, HDFC Bank, Adani Ports, Tata, Infosys.



Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from their experience without being explicitly programmed by the programmer. Machine learning focuses on the development of computer programs that can access data and use it to learn for themselves.

Deep-learning architectures such as deep neural networks, deep belief networks, recurrent neural networks and convolutional neural networks have been applied to fields including computer vision, machine vision, speech recognition, natural language processing, audio recognition, social network filtering, machine translation, bioinformatics, drug design, medical image analysis, material inspection and board game programs, where they have produced results comparable to and in some cases surpassing human expert performance.[3]

II. Theoretical framework

The algorithm we have used in theorem is prediction is LSTM i.e Long Short Term Memory which is a type of Recurrent Neural Network.

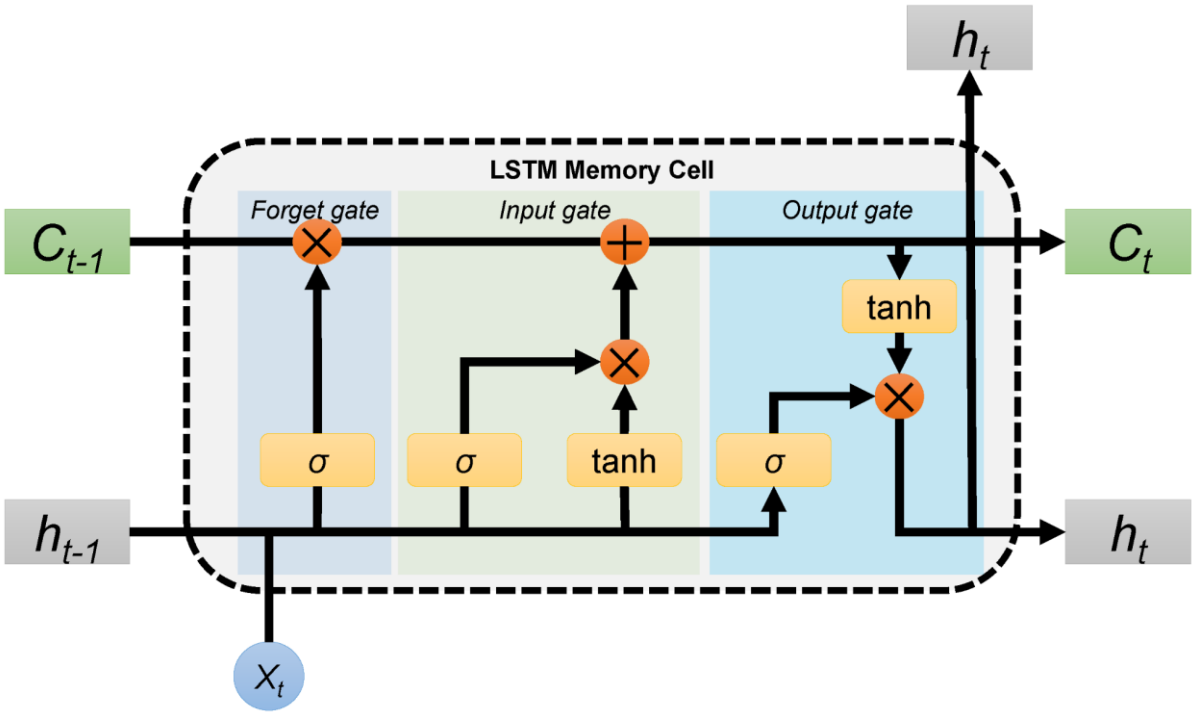
A Recurrent Neural Network i.e RNN is a type of neural network which are commonly used for ordinal problems. It uses sequential data or time series data. They are used for language processing (nlp), speech recognition, and image captioning; they are used in popular applications such as Siri, voice search, and Google Translate. It converts the independent stimulations by providing the same weights to all the layers. The main advantage of RNN is it remembers each and every information through time and the best part is it is useful for time series prediction which is called as LSTM. RNN are also used with convolutional layers.[4]

LSTM -: It is a special type or subset of RNN that can capture special dependencies for large period of time. LSTM neuron which is a type of memory cell that can store information that means, it continues its own cell state. The secret method to the LSTM lies in its special type of mechanism within each LSTM cell. While neurons in normal RNN's hardly take their previous hidden state and the current input to give output of new hidden state, an LSTM neuron also takes input as a old cell state and gives the output as its new cell state. LSTM's which also have this chain like structure, but the reiterating module has a different structure. Instead of having a single neural network layer, there are four, interacting in a very different way. An LSTM memory cell can be like this. LSTM has the following three components, or gates:

1.Forget gate: It will decides when specific portions of the cell state are to be replaced with new information. Its output values close to 1 for parts of the cell state that should be maintained, and zero for values that should be ignored.

2.Input gate : It is based on the input (i.e., previous output o(t-1), input x(t), and previous cell state c(t-1)), this section of the network learns the conditions under which any information should be retained (or modified) in the cell state

3.Output gate : It mainly depends on the input and cell state, this will decide what information is inseminated forward (i.e., output o(t) and cell state c(t)) to the node in the network. Hence, LSTM networks are very good for examining how modification in one stock's price can affect the prices of several other stocks over a long period of time. They can also decide for how long information about specific past trends in stock price movement needs to be retained in order to more accurately predict future trends in the variation of stock prices.



III. Design of the project

A Long Short Term Memory network(LSTM) is a special subset of Recurrent Neural Nets(RNN) that can capture context specific temporal dependencies for long periods of time.The LSTM model performs well to reveal the correlation of a nonlinear time-series in the delay state space and to realize the purpose of stock prediction. The stock trend prediction model based on LSTM obtained the corresponding data characteristics from the stock history data.[5]

We have set up the infrastructure for the stock price prediction using iPython Notebook, incorporating all the required Libraries (Keras, Tensor flow, Pandas, Matplotlib, Sklearn, Numpy, Plotly, Dash) and Git project organization.

Then,the following Steps were carried out in designing of the project:

● Prepare Dataset

1. Incorporate data of the required companies

2. Process the requested data into Pandas Dataframe

3. Develop function for normalizing data

4. Dataset used with a 80/20 split on training and test data across all models

● Develop Basic LSTM Model

Set up basic LSTM model with Keras utilizing parameters

● Improve LSTM Model

Develop, document, and compare results using additional labels for the

LSMT model . Document and Visualize Results

- Plot Actual, Benchmark Predicted Values, and LSTM Predicted Values per time series

- Analyze and describe results for report.

For this project measure of performance will be using the Mean Squared Error (MSE) and Root Mean Squared Error (RMSE) calculated as the difference between predicted and actual values of the target stock at adjusted close price and the delta between the performance of the benchmark model (Linear Regression) and our primary model (Deep Learning).

IV. Conclusion and Future Scope:

This paper provides a system for predicting stock price value using Artificial Neural Network that will be beneficial for shareholders. Our main goal is to get maximum profit from the stock by using such a system for prediction. Investors make great efforts to out-perform the market. Stock prediction will always be an area of research. This system will be more accurate and the error rate will reduce if we use more amounts of data for the training process. Further research on this topic can be done by acquiring relevant information from financial news data and using this information for prediction purposes. In the future, we will work to include more companies for price prediction, improve our GUI making it more interactive for the user and try to predict the prices based on more factors.

V. References

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