An Automatic Stock Price Prediction Using Machine Learning

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ABSTRACT

In this project we attempt to implement machine learning approach to predict stock prices. Machine learning is effectively implemented in forecasting stock prices. The objective is to predict the stock prices in order to make more informed and accurate investment decisions. We propose a stock price prediction system that integrates mathematical functions, machine learning, and other external factors for the purpose of achieving better stock prediction accuracy and issuing profitable trades. There are two types of stocks. You may know of intraday trading by the commonly used term "day trading." Interday traders hold securities positions from at least one day to the next and often for several days to weeks or months. LSTMs are very powerful in sequence prediction problems because they're able to store past information. This is important in our case because the previous price of a stock is crucial in predicting its future price.

I. INTRODUCTION

Stock Market is one of the active methods where a normal person would trade stocks, make investments and earn some money out of companies that sell a part of themselves on this platform. This system proves to be a potential investment schemes if done wisely. The prices and the liquidity of this platform is highly unpredictable and this is where we bring technology to help us out. Machine learning is one such tool that helps us achieve what we want.

Indian Stock Market Overview:

Almost every country has one or more stock exchanges, where the shares of listed companies can be sold or bought. It is a secondary market place. When a company first lists itself in any stock exchange to become a public company, the promoter group sells substantial amount of shares to public as per government norms. During incorporation of a company shares are bought by promoter groups or institutional investors in a primary market. Once promoter offloads major portion of the shares to public relail investors, then those could be traded in secondary market i.e. in stock exchanges.

In India the BSE (Bombay Stock Exchange) and NSE (National Stock Exchange) are the two most active stock exchange. The BSE has around 5000 listed companies where as NSE had around 1600. Both the exchange has similar trading mechanism and market open time, closing time and settlement process. Stock exchanges helps individual investors to take part in the share market and allows to buy even a single share of some listed company with the help of a trading account and demat account. These online markets have revolutionized the Indian investment arena along with government initiative like tax benefit on equity investment, National Pension Scheme (NPS) investing in share market etc. Due to continuous reduction in bank interest rates and increasing inflation middle class investors are moving towards equity market from the safe heaven of fixed deposites. All these have helped to grow the capitalization of both the exchanges.

Due to the high profit of the stock market, it is one of the most popular investments. People investigated for methods and tools that would increase their gains while minimizing the risk, as the level of trading and investing grew. Some forecasting models which have been designed in the past years are developed for this kind of purpose and they had been applied to money market prediction. Generally, this classification is done by:

1. Time Series Analysis.
2. Fundamental Analysis.
3. Technical Analysis.

Mustain Billah, Sajjad Waheed [1] proposed an improved Levenberg Marquardt (LM) training algorithm of artificial neural network. Traditional statistical prediction methods such as linear regression, time series analysis, chaos theory were popular. But for the uncertainty in stock market, these methods were failure or partially successful. Soft computing techniques such as neural network, fuzzy systems have been applied to solve this problem as they capture the non-linearity of stock market. Though there are many research works on stock prediction on different Stock Exchange trend, there are very little works on Bangladesh perspective. By modifying training algorithm of neural network this performance of this model can be improved. Hence the goal of this paper is to acquire better performance than existing works. Improved Levenberg Marquardt algorithm of neural network can predict the possible day-end closing stock price with less memory and time needed, provided previous historical stock market data of Dhaka Stock Exchange such as opening price, highest price, lowest price, total share traded. This improved LM algorithm shows better result than Adaptive Neuro Fuzzy Inference System (ANFIS). It also requires less computing time and allocate less memory than traditional LM algorithm of neural network. Typically, neural networks are adjusted, or trained based on a comparison of the output and the target, until the network output matches the target. After the artificial neural network has been trained with known values, then it can perform decision making. The steepest descent algorithm, also known as the error backpropagation (EBP) algorithm is one of the most significant breakthroughs for training neural networks. But it is known as an inefficient algorithm because of its slow convergence. The slow convergence of the steepest descent method can be greatly improved by the Gauss-Newton algorithm. The Gauss- Newton algorithm can find proper step sizes for each direction and converge very fast. But this improvement only happens when the quadratic approximation of error function is reasonable. Otherwise, the Gauss-Newton algorithm would be mostly divergent. The Levenberg Marquardt algorithm combines the steepest descent method and the Gauss- Newton algorithm. It inherits the speed advantage of the Gauss-Newton algorithm and the stability of the steepest descent method. Its more robust than the Gauss-Newton algorithm, because in many cases it can converge well even if the error surface is much more complex than the quadratic situation.

II. METHODS AND MATERIAL

Neural networks reflect the behavior of human brain, allowing computer programs to recognize patterns and solve common problems in the fields of Artificial Intelligence, Machine Learning and these systems learn to perform tasks by being exposed to various datasets and examples without any task-specific rules. The idea is that the system generates identifying characteristics from the data they have been passed without being programmed with a pre-programmed understanding of these datasets.

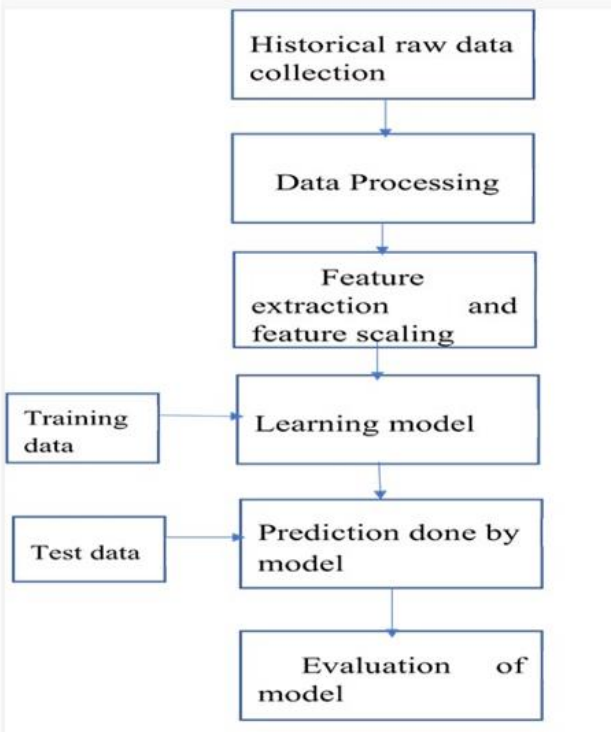


Figure 1: Flowchart of stock price prediction

A. Data collection:

The most crucial step when starting with ML is to have data of good quality and accuracy. Data can be collected from any authenticated source. High-quality and accurate data will make the learning process of the model easier and better and at the time of testing, the model would yield good results. A huge amount of capital, time and resources are consumed in collecting data. Organizations or researchers have to decide what kind of data they need to execute their tasks or research.

B. Data Processing:

Data Processing is the task of converting data from a given form to a much more usable and desired form i.e., making it more meaningful and informative. Using Machine Learning algorithms, mathematical modelling, and statistical knowledge, this entire process can be automated. The output of this complete process can be in any desired form like graphs, videos, charts, tables, images, and many more, depending on the task we are performing and the requirements of the machine.

C. Feature Extraction:

Feature extraction is about extracting/deriving information from the original features set to create a new features subspace. The primary idea behind feature extraction is to compress the data with the goal of maintaining most of the relevant information. These techniques are also used for reducing the number of features from the original features set to reduce model complexity, model overfitting, enhance model computation efficiency and reduce generalization error.

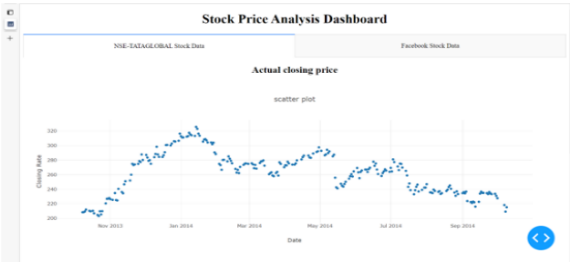
Training Model:

Similar to feeding somethings, machine/model should also learn by feeding and learning on data. The dataset extracted from Kaggle will be used to train the model. The training model uses a raw set of data as the undefined dataset which is collected from the previous fiscal year and from the same dataset a refine view is presented which is seen as the desired output. For the refining of the dataset various algorithm.

III. RESULTS AND DISCUSSION

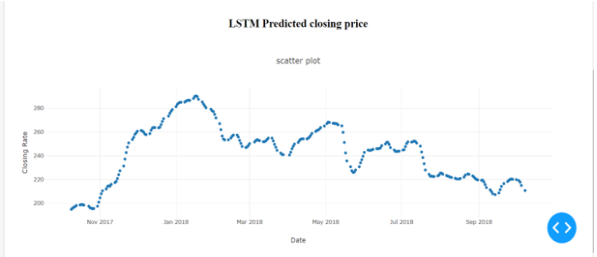
Once the model is ready, the model is used to obtain the desired results in any form we want. In this case, graph is plotted for the results as per requirements where x-axis represents the date and y-axis represents the closing price of stock. The dataset is collected from Kaggle website. Then the data is given to the model to predict the closing price. Next the data is preprocessed and LSTM model is implemented.

Actual Closing Price: The figure shows the scatter graph of the actual closing price of the dataset we have selected. The x-axis represents the date and the y-axis represents the closing price.



Plot of Actual Closing Price

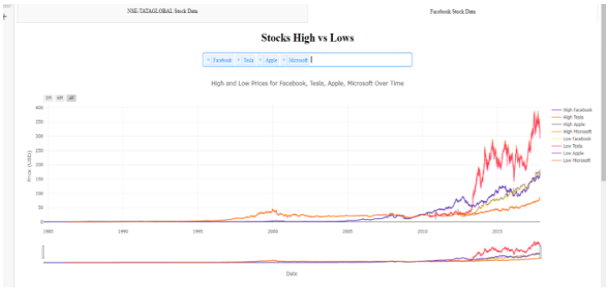
LSTM Predicted Closing Price: The figure shows a scatter graph of the predicted closing price using LSTM method. The LSTM predicted Closing price graph and the Actual closing price graph are similar to each other.



Plot of LSTM Predicted Closing Price

Stocks High v/s Low: The figure shows a graph of Facebook High and Low values. The purple colored line indicates the high value of the Facebook and the orange colored line indicates the low value of the Facebook.

Plot of High vs Low of Facebook



Plot of High vs Low of Facebook, Tesla, Apple & Microsoft

Plot of Stock Market Volume

Plot of High vs Low of Facebook, Tesla, Apple & Microsoft

IV.CONCLUSION and FUTURE SCOPE:

The aim of this project is to predict the stock price using Long Short-Term Memory (LSTM) algorithm of Recurrent Neural Network (RNN). The dataset is extracted from Kaggle. Twenty years' stock price of NIFTY 50 is considered to predict future stock price. Machine learning is recommended to predict stock price. Considering the graph we can predict the closing price of the stock market close to the actual price where the model captures the hidden feature and uses various strategies to make prediction. LSTM model architecture has proved very efficient in predicting the stock price by changing the configuration accordingly, which also uses back propagation mechanism while gathering and grouping data to avoid overlapping of data. So finally changing market price of stocks might be variable or may not follow the same cycle which is based on the company's various sector and trends.

V. Future Scope:

Various neural network techniques can be applied to the processed data to make the machine more powerful. Advanced neural network techniques can be applied to the processed dataset. The neural network techniques make use of time series to accurately predict the stock values. Various other features like asset value, equity ratio, etc. can be taken into consideration to further improve the accuracy. Related tweets from twitter can also be considered while predicting the future stock prices.

The methods mentioned in this project can be applied to real time data to get real time predictions of the stock value. Thus it can be deployed in real world application providing a more reliable way of understanding stock price changes. Accurate graphs can be plotted for a particular company to understand the patterns of stock values and thus making it easy to understand specific patterns.

VI. References:

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