

Stock Market Predictor using Long short-term Memory (LSTM) Technique



Ashish Virendra Chandak

Abstract: *In the stock market, it is important to have accurate prediction of future behavior of stock price..Because of the great chance of financial loss as well as scoring profits at the same time, it is mandatory to have a secure prediction of the values of the stocks. But when it comes to predicting the value of a stock in future we tend to follow stock market experts but as technology is progressing we may use these technologies rather than following human experts who may be biased many times. Stock price prediction has been interesting area for investors and researchers. This article proposes an approach towards prediction of stock price using machine learning model Long Short Term Memory. This is an ensemble learning method that has been an exceedingly successful model for predicting sequence of numbers and words. Long Short Term Memory is a machine learning model for prediction. This technique is used to forecast the future stock price of a specific stock by using historical data of the stock gathered from Yahoo! Finance.*

Keywords : LSTM, Stock price prediction

I. INTRODUCTION

Stock prices are very fluctuating and prediction of stock price is very challenging task. But still it is the best way to invest money as it has very high returns. This high returns attract a lot of investors to the stock market. When investors are new to the business they tend to follow stock market predictions shown on news, online site but following such predictions may not be a good idea always. Many investors get caught in trap of fraud people and who assure them for success then they go on losing their money which was invested as well as the commission paid to the expert. Doing own research in traditional way is good but it takes a lot of time, skills and thinking to analyze the data. Stock market is basically non linear in nature and the research on stock market is one of the most important issues in recent years. Investors invest in stock market based on some predictions. To predict the stock market prices investors usually do their own research search or get help from stock market experts but sometimes biased, wrong decisions lead them to great financial loss, so they search for such methods and tools which will increase their profits, while minimizing their risks.

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Prediction plays a very important role in stock market business which is very complicated and challenging process. Employing traditional methods may not ensure the reliability of the prediction. This work help

- i) Help investors get rid of fraud people who try to fool them with fake stock market related predictions.
- ii) Let investors have accurate and quick future predictions of stock prices on their own.
- iii) Make investors self-dependent while interacting with stock market.
- iv) Helps the human experts to predict the market with more accuracy, thus reducing the stress on the human experts regarding the prediction.
- v) Reduces errors in the prediction and helping investors

II. RELATED WORK

Stock market provides s high returns as compare other investment instrument. But investor is expecting a strategy to predict valuation of stock price. But stock market is influence by many factors viz. Political and economic environment, company conditions, supply and demand, investor psychology, etc. These factors make prediction challenging task [5].

Jia[12] investigated the effectiveness of LSTM neural networks for stock market prediction. Chen et al. [13] predicted China stock returns using LSTM. The historical data of China stock market were transformed into 30-days-long sequences with 10 learning features and 3-day earning rate labeling. Xie et al. [14] and that RNN is effective to forecast stock price and useful for stock market investors to make an investing decision. A robust and novel hybrid model was proposed for prediction of stock returns [15], which is constituted of auto regressive moving average model, exponential smoothing model and RNN[16].

III. LONG SHORT-TERM MEMORY (LSTM) TECHNIQUE

Long short-term memory (LSTM) is an artificial recurrent neural network (RNN) architecture used in the field of deep learning. LSTM networks are well-suited to classifying, processing and making predictions based on time series data, Looking at great results of LSTM in predicting time series data we decided to go with LSTM and we python has LSTM libraries so we didn't had to go in the complications of the LSTM but we were able to use it to our advantage. In this project we used LSTM model with 2 main layer and 50 nodes in each layer.

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As we go on increasing the number of nodes in the layers the output of the LSTM model becomes more accurate but increasing this parameter tends to increasing the time required for training and prediction. We are using last 5 years of data for a stock which we are downloading from Yahoo! Finance and it has total 1259 rows which are indexed by the date of the data being taken. We did data preprocessing and then divided

data into 2 parts one part for training and one part for testing. In this project we used LSTM model with 2 main layer and 50 nodes in each layer. As we go on increasing the number of nodes in the layers the output of the LSTM model becomes more accurate but increasing this parameter tends to increasing the time required for training and prediction. The LSTM model we created and used is as below Figure 1.

```
# create and fit the LSTM network
model = Sequential()
#first layer
model.add(LSTM(units=50, return_sequences=True, input_shape=(x_train.shape[1],1)))
#second layer
model.add(LSTM(units=50))
model.add(Dense(1))
model.compile(loss='mean_squared_error', optimizer='adam')
model.fit(x_train, y_train, epochs=1, batch_size=1, verbose=2)
```

Figure 1: LSTM model used.

Date	High	Low	Open	Close	Volume	Adj Close
2019-04-30	203.399994	199.110001	203.059998	200.669998	46534900.0	200.669998
2019-05-01	215.309998	209.229996	209.880005	210.520004	64827300.0	210.520004
2019-05-02	212.649994	208.130005	209.839996	209.149994	31996300.0	209.149994
2019-05-03	211.839996	210.229996	210.889999	211.750000	20857500.0	211.750000
2019-05-06	208.839996	203.500000	204.289993	208.479996	29908886.0	208.479996

Figure 2:

Our training dataset has 1000 rows and our testing dataset has 259 rows in it. Originally the data frame had six rows but we used closing values of stocks only and predicted closing values of the specific stock. We made new data frame containing date as index and close as the only columns so the training and testing purpose which is shown Figure 3.

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IV. RESULTS

In this project we are predicting future stock price of the stock by using historical data. There are few site which provide historical data of stocks. We chose Yahoo! Finance for historical data of stocks. The data provided by the Yahoo! Finance is well sorted and very well managed. We used data from the time of use to five years back. We downloaded data using pandas data reader, which is represented in the figure 2. We are using last 5 years of data for a stock which we are downloading from Yahoo! Finance and it has total 1259 rows which are indexed by the date of the data being taken. We did data preprocessing and then divided data into 2 parts one part for training and one part for testing. Our training dataset has 1000 rows and our testing dataset has 259 rows in it. Originally the data frame had six rows but we used closing values of stocks only and predicted closing values of the specific stock. We made new data frame containing date as

Date	Close
2019-04-30	200.67
2019-05-01	210.52
2019-05-02	209.15
2019-05-03	211.75
2019-05-06	208.48

Figure 3 DataFrame used to Train and Test

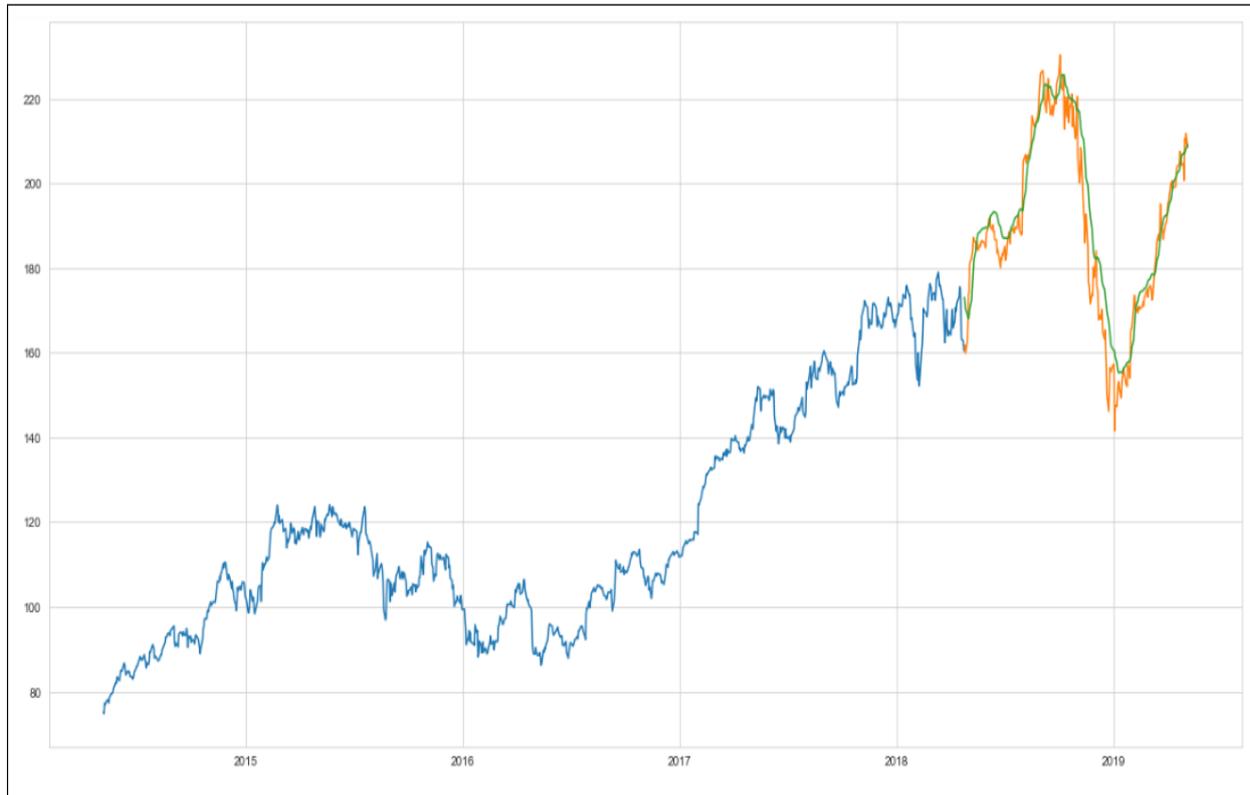


Figure 4 Output for Epoch=1.

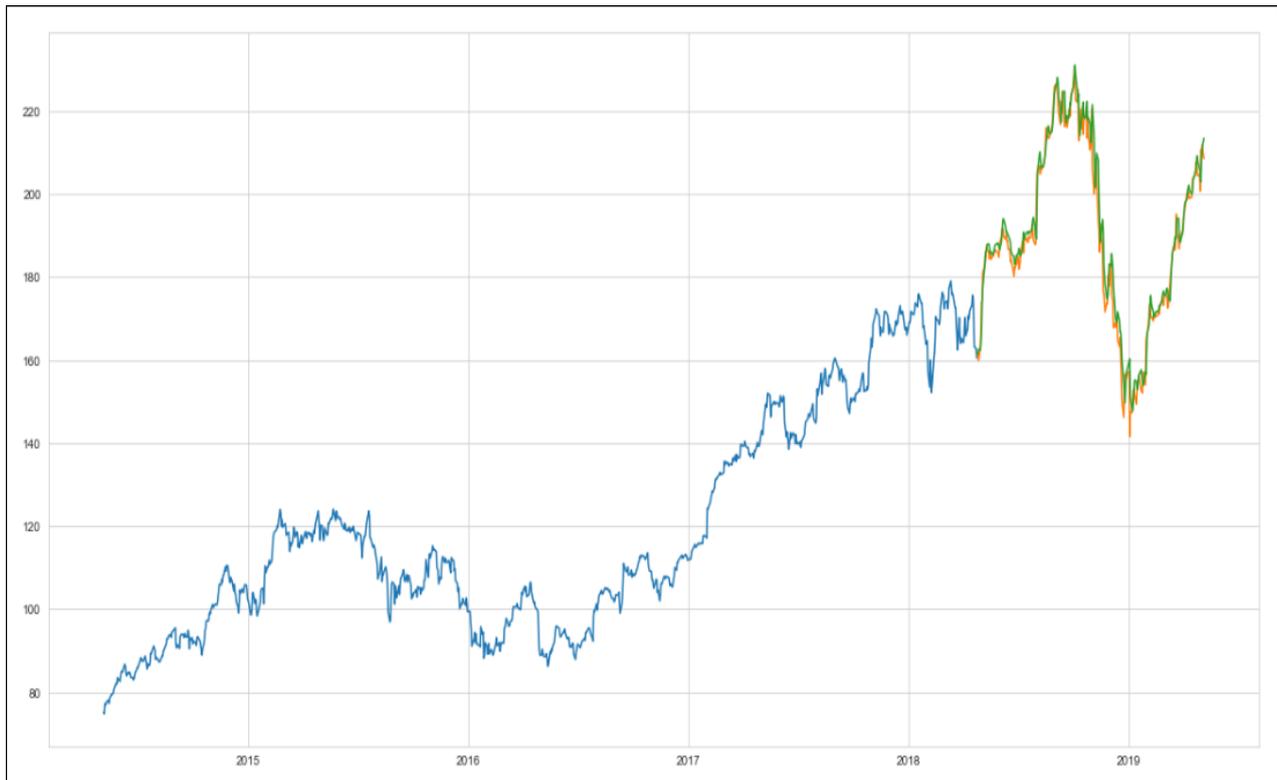


Figure 5 Output for Epoch=5.

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A. Low Epoch

An epoch is a measure of the number of times all of the training vectors are used once to update the weights. When we had low epochs i.e. when we set epoch to 1 we had quite accurate result and time complexity was also less, it took 59 seconds and the loss was also less i.e. 0.0018, which is mean squared error and having it very less is a sign of model being well trained. Setting low epoch not bad for our work as it is giving us good output as well as the time complexity is less. In the output graph shown in Figure 4, the line in blue is the closing value of the stock which we used for training and the line in orange is of the closing values we used for training the model and the graph in green is of the predictions we made. We plotted them on each other so that we could see how close or apart they are and we could see that they are pretty close and the predictions are very good. Predicting such unstable data is tough task but still this algorithm is working wonders.

B. High Epoch

Increasing epoch increases how many times the weights of the model are updated. Increasing epoch makes model more and more perfect as results attend the perfection but after increasing epoch up to a level weights start saturating as they reach their optimum value.

Now we increased the value of epochs to 5 shown in Figure 5, to see how close the prediction of Closing value we get and in the graph below we could see how accurate the prediction are made but the problem with increasing epoch is that the time complexity has increased a bit as well as the machine starts heating, this time the algorithm took 280 seconds, the losses were minimized to very low that they were almost negligible i.e. 0.00032676 and the laptop also got hot due to large number of iterations and heavy load. As we go on increasing epoch to a certain level the predictions become more accurate but the time complexity also increases.

V. CONCLUSION

Stock markets is great place to invest according to many researches for greater returns over time but there is risk involved with the great returns. Stock markets are hard to monitor and require plenty of context when trying to interpret the movement and predict prices. A lot of research has been going around to predict the stock prices in the few decades. In this project with the programming language Python and its libraries we predicted the future stock price. We used Yahoo! Finance for the historical data of companies of 5 years and used LSTM algorithm to predict the Stock Closing Price for the trading day as we found that LSTM is the best method for predicting time series data with great accuracy through many research papers. The predictions with epoch set to 1 were good but as we went on increasing the epochs the predictions became more and more accurate. So it is up to us if we want more accuracy and have powerful machines and a bit of time then we can go for more epochs and if we want quick but good results we still can go for lower epochs. The results of the project are pretty accurate but still when it comes stock market predicting perfectly isn't possible as stock market price could increase rapidly in no time or fall like cards as there are many factors to consider and along with that stocks

are very sensitive to news and they could be hoax, so being conscious and aware about the market and news and using this tool investors could perform well in stock market.

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