STOCK MARKET PREDICTION USING LONG SHORT-TERM MEMORY (LSTM)

MINI PROJECT BY

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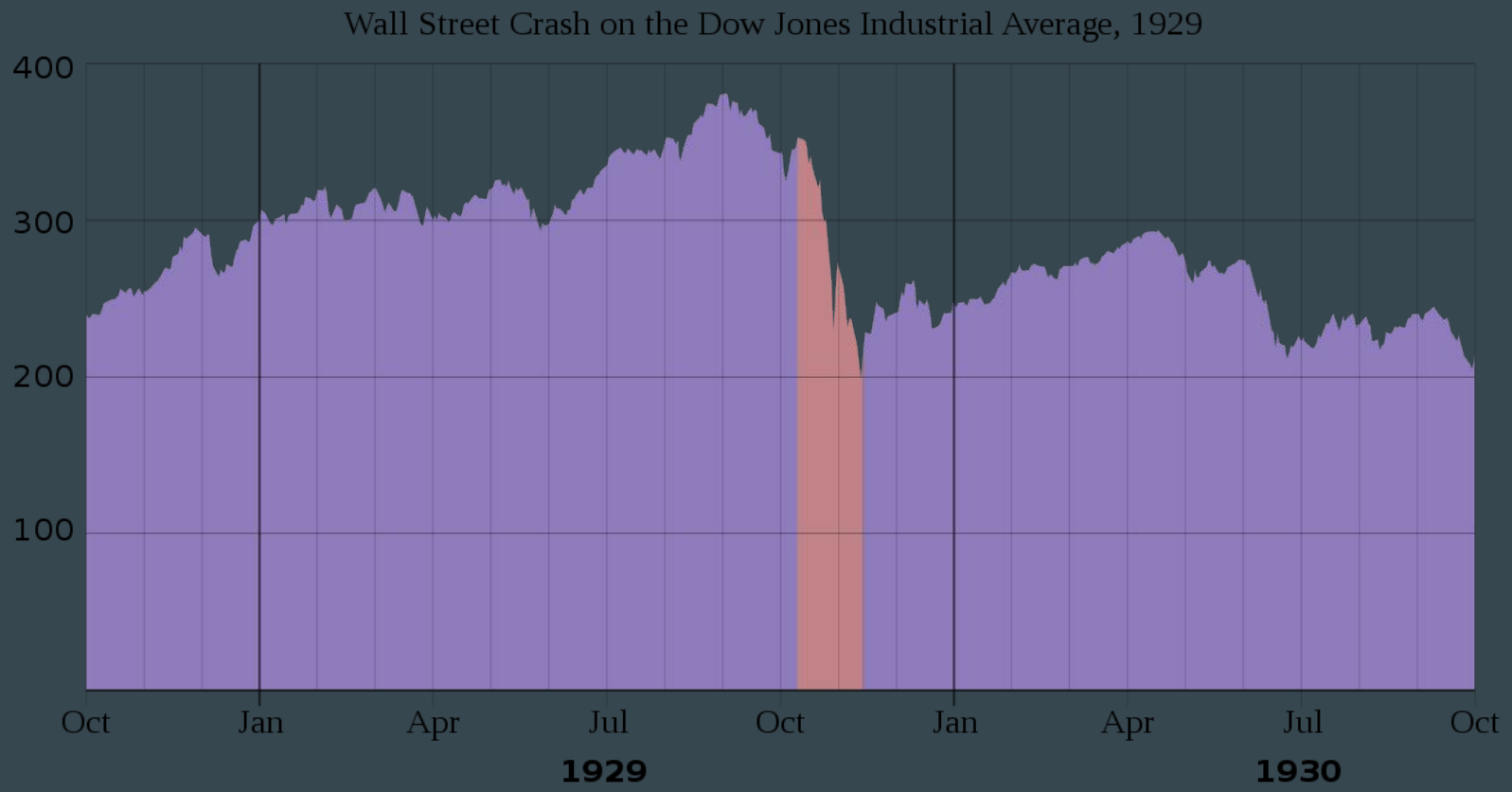
INTRODUCTION

WHAT IS THE STOCK MARKET?

A stock market, equity market or share market is the aggregation of buyers and sellers (a loose network of economic transactions, not a physical facility or discrete entity) of stocks (also called shares), which represent ownership claims on businesses; these may include securities listed on a public stock exchange, as well as stock that is only traded privately.

MOTIVATION TO PREDICT THE STOCK MARKET



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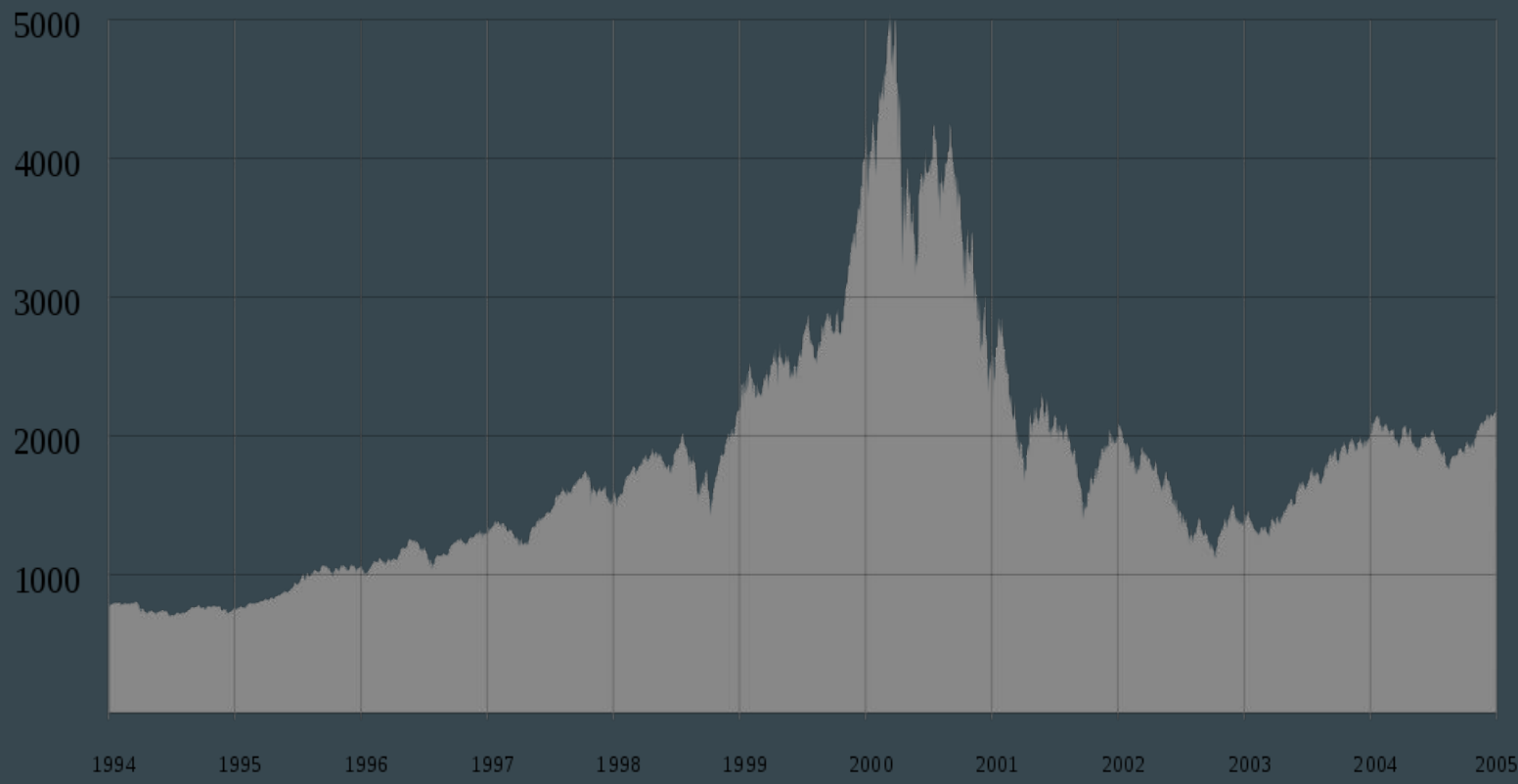
MOTIVATION TO PREDICT THE STOCK MARKET



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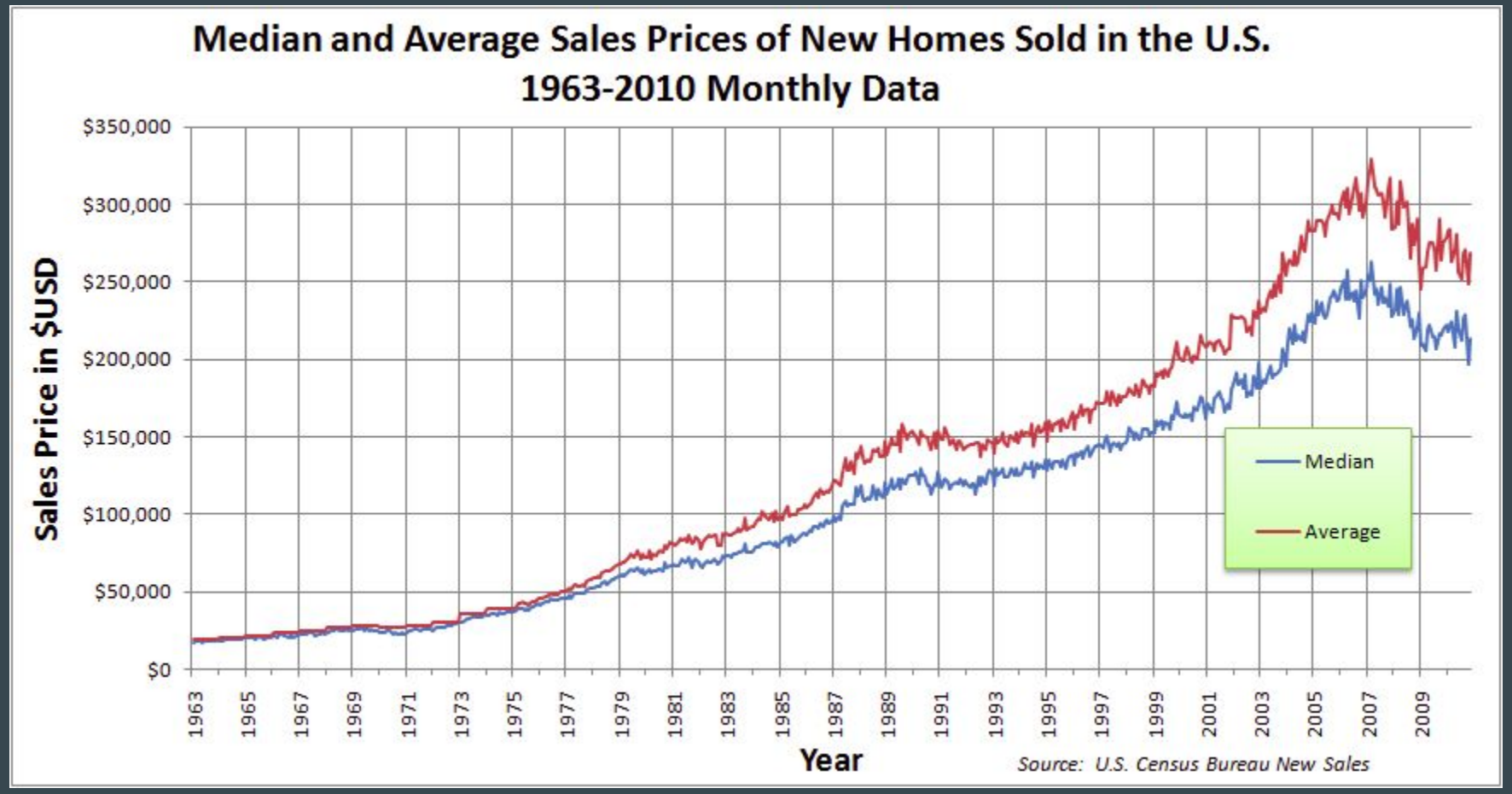
MOTIVATION TO PREDICT THE STOCK MARKET



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MOTIVATION TO PREDICT THE STOCK MARKET

- Help policy makers to take steps to preserve the fairness of the market and prevent any foul play.
- It can help in the determination of poorly performing market sectors.
- Helps the general public make informed decisions. Thus, market disasters and bubbles can be avoided.
- Predicting and probing the economic future of any asset is crucial in deciding the risk of investments. This helps in the detection and prevention of the existence of shell companies.

OBJECTIVES

To build a Long short term memory (LSTM) Recurrent Neural Network (RNN), which can predict the values of the indices of the stock market at a future date and to test the viability and accuracy of such a model.

RELATED STUDY

RELATED STUDY

Armando Bernal, Sam Fok, Rohit Pidaparthi, *Financial Market Time Series Prediction with Recurrent Neural Networks.*

Employing Echo State Network Implementation (ESN), a very good prediction of the stock market was obtained. A comparison with the Kalman Filter was done and the ESN method proved to make the error ~0.1 times the error in the Kalman Filter technique. This demonstrated the viability of a Neural Network architecture predicting the stock market with very less error.

GAPS IN THE STATE-OF-THE-ART

- Indian stock exchanges was not analysed.
- The study did not employ the LSTM architecture for its findings.
- No results of the LSTM architecture for the prediction of Stock Exchange Indices was analysed.

WORK PLAN

DIFFERENT STEPS IN THE PROJECT

1. Data gathering and “Data cleaning”
2. Looking for the right Recurrent Neural Network (RNN) architecture
3. Figuring out a way to make the prediction (the parameters)
4. Figuring out a proper normalised error function
5. Exporting, analysing and plotting the data
6. Making the program versatile enough to do multiple training and testing without any human intervention (Automating steps 2 to 5)
7. Finding out the optimum parameters for the RNN architecture
8. Preparing the report and presentation

PREDICTION MODEL

LONG SHORT-TERM MEMORY

LONG SHORT-TERM MEMORY

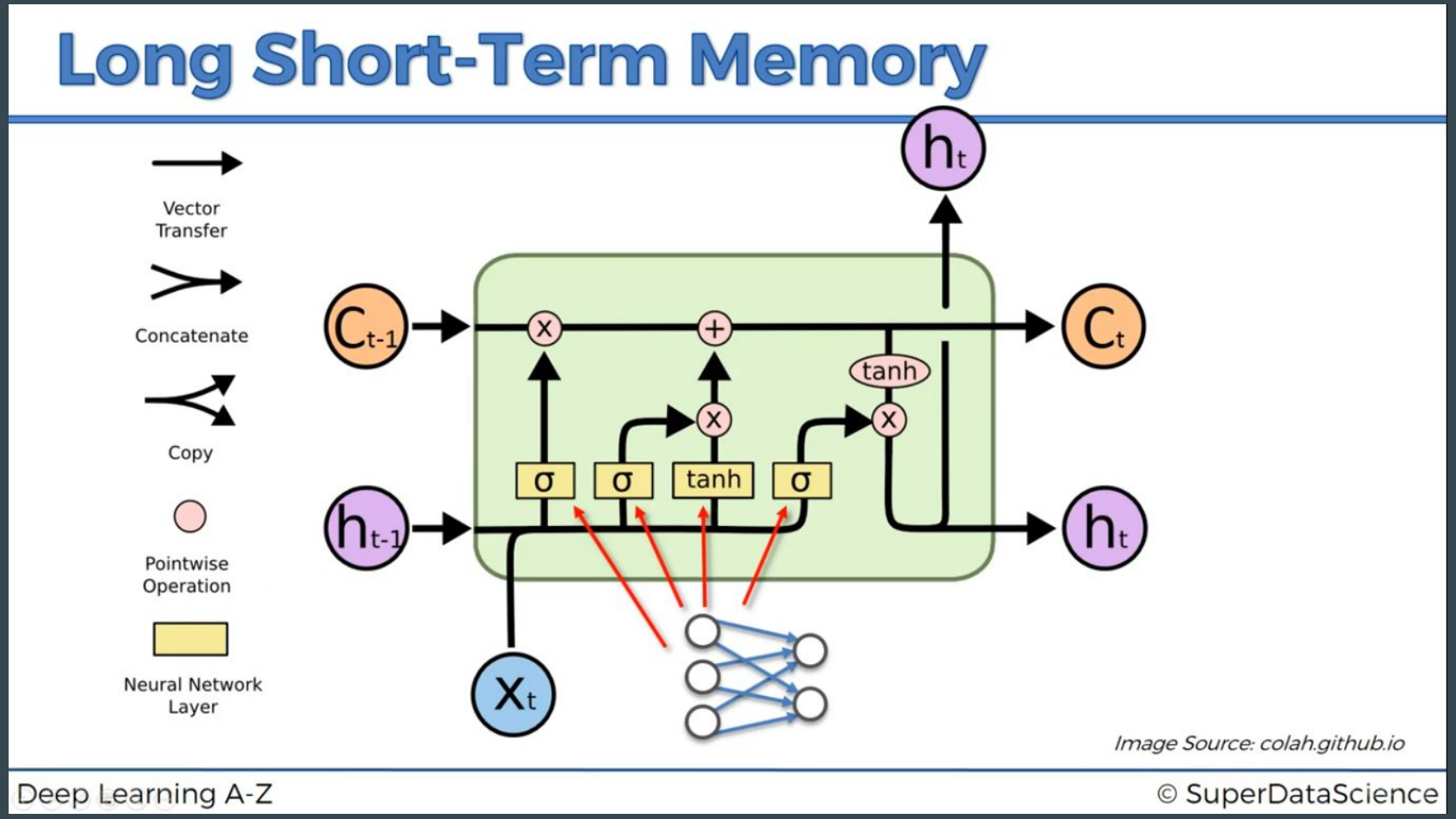
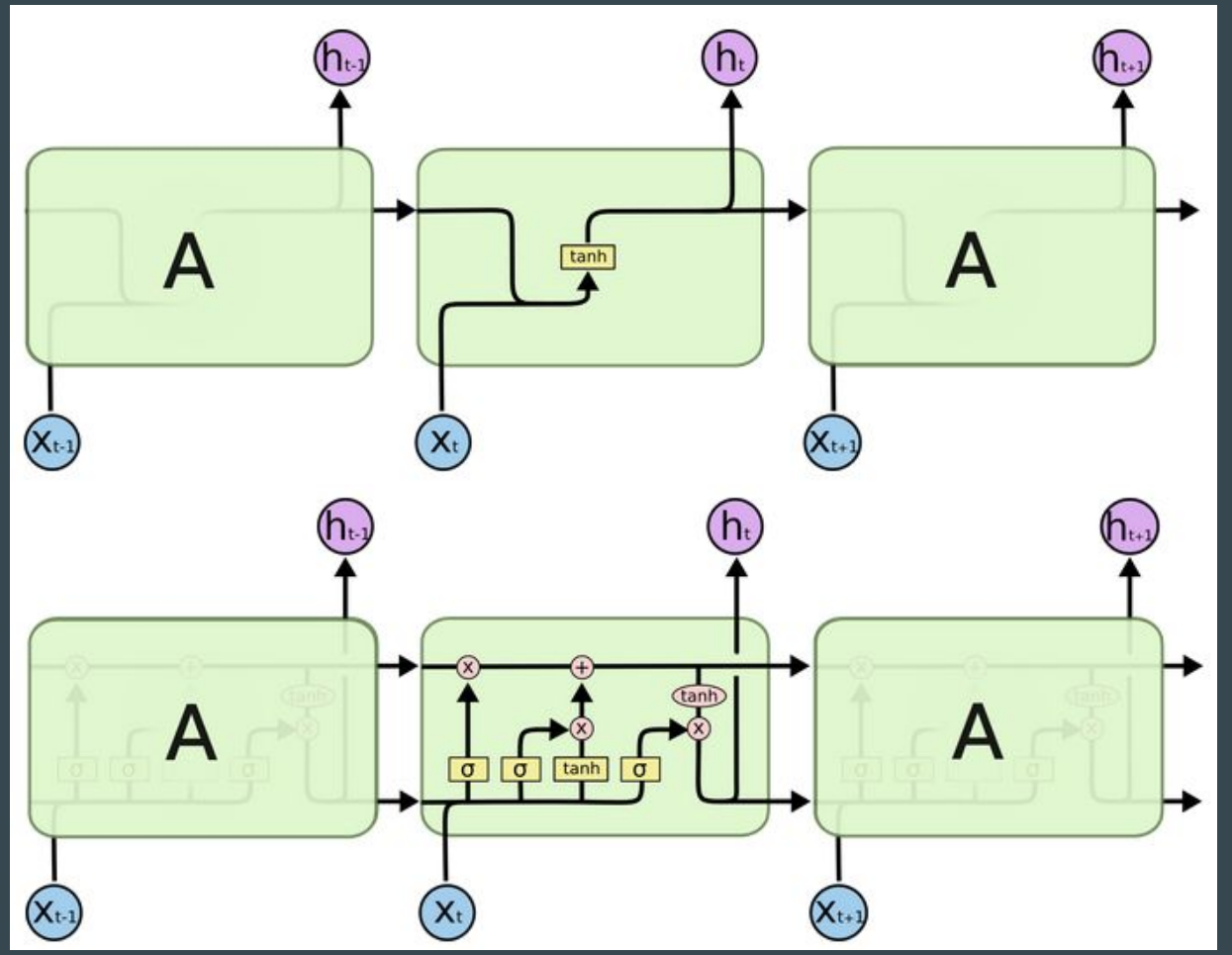


Image Source: colah.github.io

LONG SHORT-TERM MEMORY



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RESULTS AND DISCUSSION

DATA

- 1. S&P BSE India Government Bond Index

  2. S&P BSE SENSEX

  3. S&P BSE SENSEX 50 TR

  4. S&P BSE 100

  5. S&P BSE Bharat 22 Index TR

- In the range of July 1 2009 to 31 December 2018.
- ~3250 x 5 datapoints.

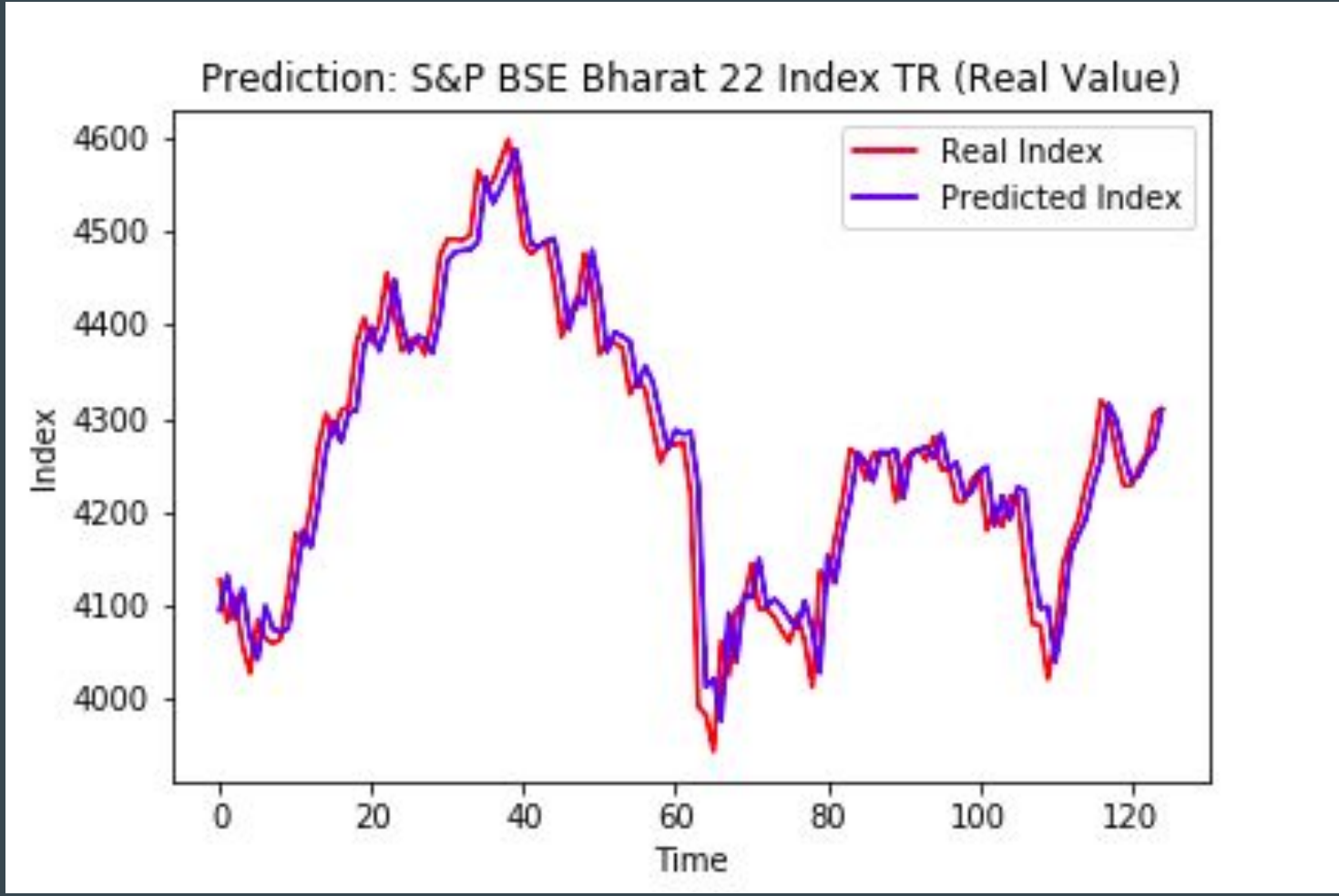
- NIFTY 50
  1. Open
  2. Low
  3. High
  4. Close
  5. Shares Traded
  6. Turnover (in crores of rupees)

- In the range from October 3, 2017 to September 30, 2019

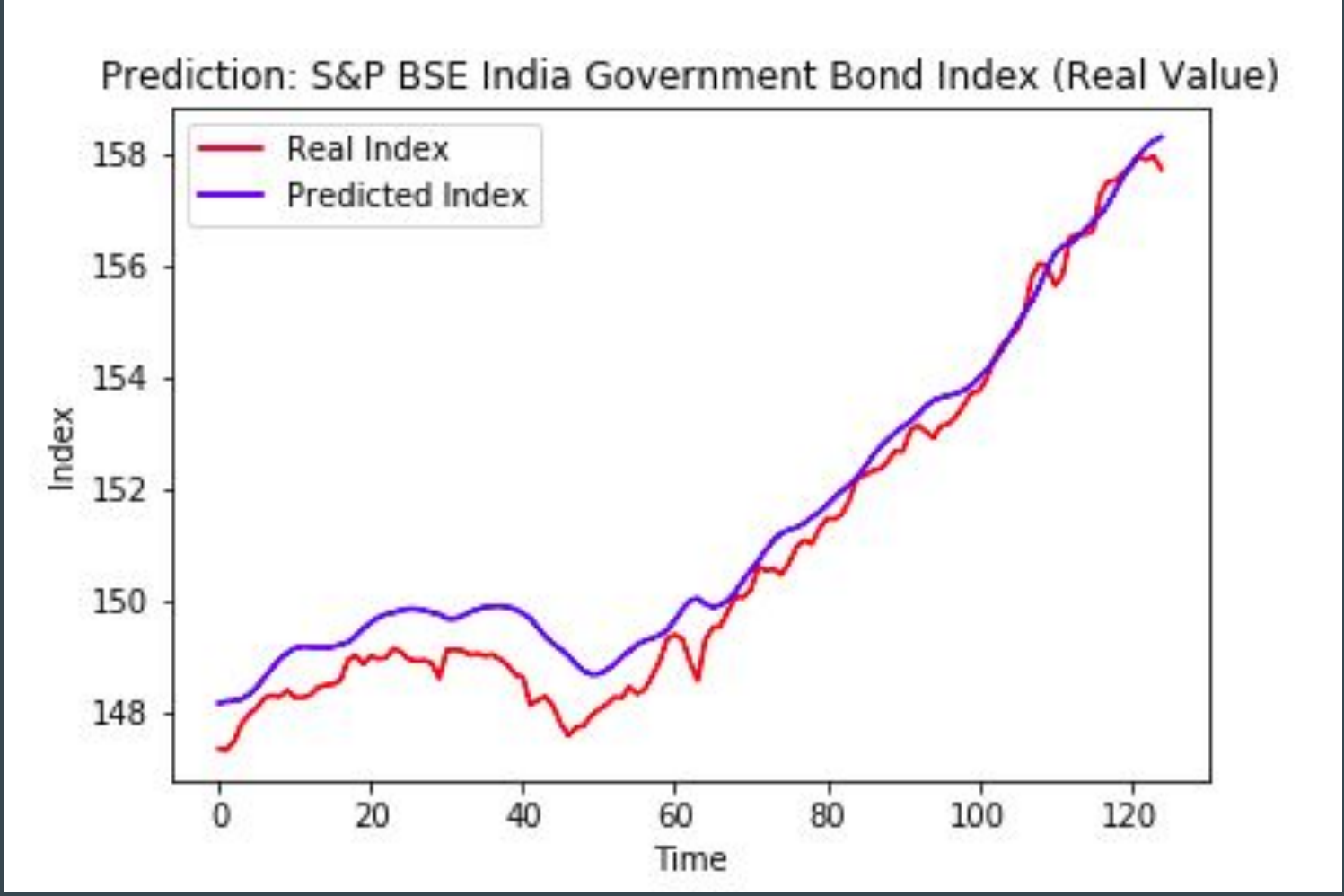
- ~720 x 6 datapoints.

RESULTS

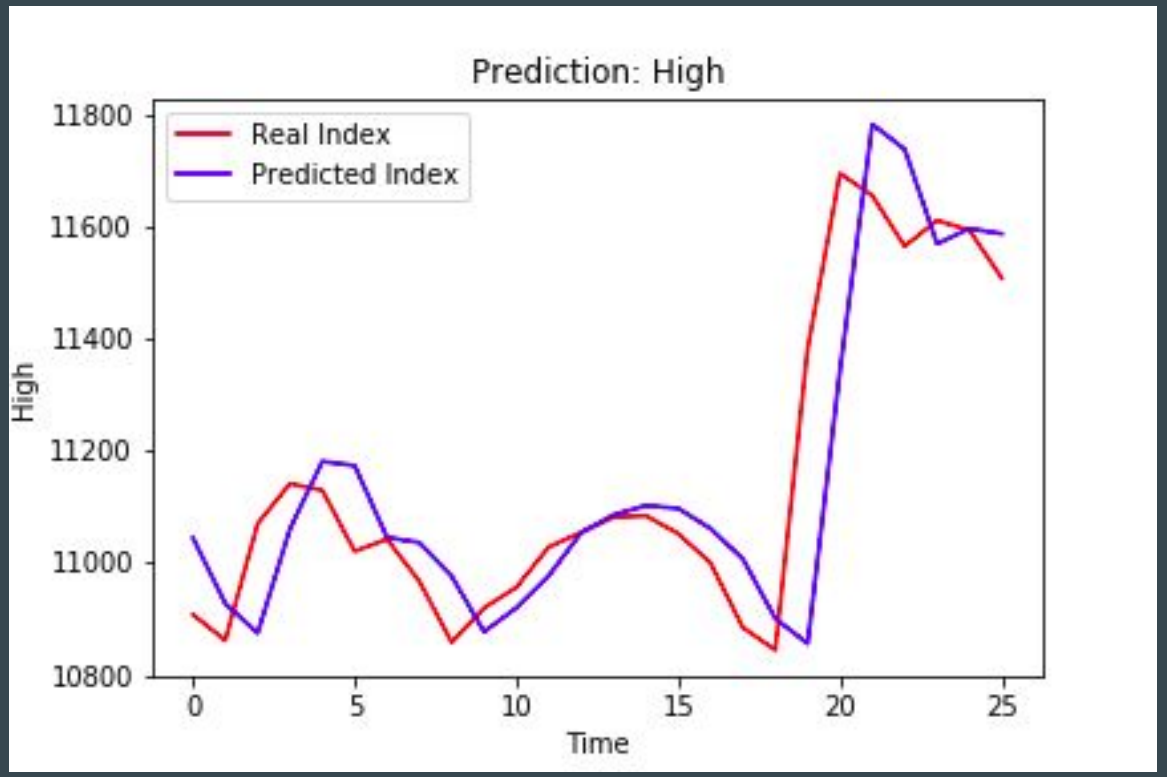
RESULTS

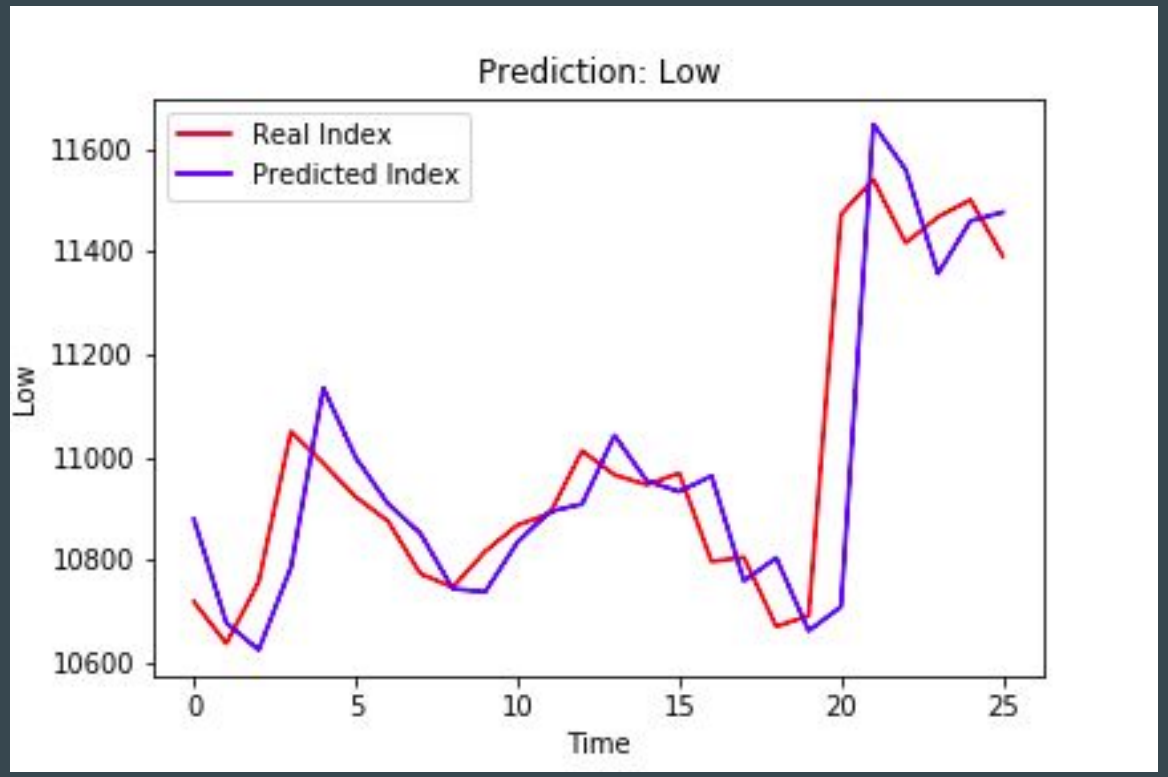

Prediction: S&P BSE Bharat 22 Index TR (Real Value)
Real Index
Predicted Index
Index
4600
4500
4400
4300
4200
4100
4000
0
20
40
60
80
100
120
Time

RESULTS

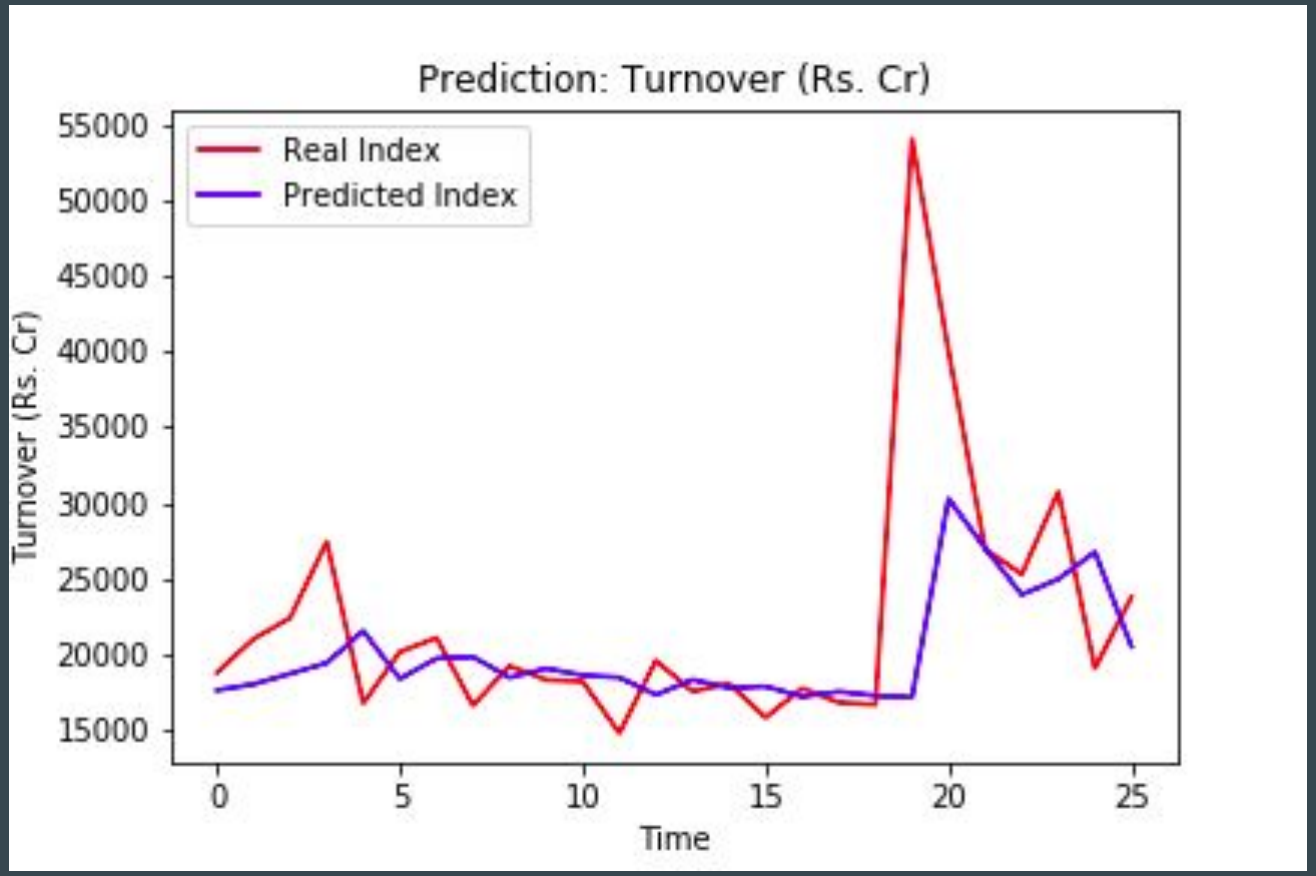

Prediction: S&P BSE India Government Bond Index (Real Value)
Real Index
Predicted Index
158
156
154
152
150
148
Index
0
20
40
60
80
100
120
Time

RESULTS


Prediction: High
Real Index
Predicted Index
High
Time
11800
11600
11400
11200
11000
10800
0
5
10
15
20
25


Prediction: Low
Real Index
Predicted Index
Low
Time
11600
11400
11200
11000
10800
10600
0
5
10
15
20
25

RESULTS


Prediction: Turnover (Rs. Cr)
Real Index
Predicted Index
Turnover (Rs. Cr)
55000
50000
45000
40000
35000
30000
25000
20000
15000
0
5
10
15
20
25
Time

ERROR

Data	Error (%)
S&P BSE India Government Bond Index (Real Value)	0.038412246356934
S&P BSE SENSEX (TR) (Real Value)	0.080711779819695
S&P BSE 100 (TR) (Real Value)	0.124062764136015
S&P BSE Bharat 22 Index TR (Real Value)	0.092884458481529
S&P BSE SENSEX 50 TR (Real Value)	0.136435304210502

ERROR

Data	Error (%)
Open	0.334551838883021
High	0.25558133011403
Low	0.335949563042953
Close	0.302589479706711
Shares Traded	6.19013443491534
Turnover (Rs. Cr)	7.14826612384214

CONCLUSION
AND
FURTHER WORK

CONCLUSION

1. Prediction of stock market using LSTM architecture is very much possible.
2. The prediction must be done by a model which has been trained on a large dataset.
3. The number of epochs should be made as large as possible.
4. The number of middle layers is to be kept less.
5. A large enough number of units in the middle layers must be kept.
6. Any sudden change in the market can throw the prediction model off balance for a little while and its accuracy can plummet.

FURTHER WORK

1. Making the prediction better by employing Echo State Network Implementation (ESN).
2. Computing optimal set ups for setting up the RNN model.
3. Testing the viability of Transfer Learning, if it is possible as a generality or as a case by case basis.
4. Finding correlation between stock market fluctuations and prices of commodities, Consumer Price Index of G20 countries, environmental hazards, political tensions, etc.

THE END