

Stock Market Prediction Using Recurrent Neural Network

K. Ritwik Reddy

Department of CSE (AI & ML)

Vardhaman College of Engineering,
Hyderabad, India

kolanritwikreddy20aiml@vardhaman.org

B. Tarun Kumar

Department of CSE (AI & ML)

Vardhaman College of Engineering,
Hyderabad, India

barkatarunkumar21aiml@student.vardhaman.org

V. Rohit Ganesh

Department of CSE (AI & ML)

Vardhaman College of Engineering,
Hyderabad, India

rohitganeshveepuri20aiml@vardhaman.org

Polisetty Swetha

Department of CSE (AI & ML)

Vardhaman College of Engineering, Hyderabad, India
swethabharath27@gmail.com

Prakash Kumar Sarangi

Department of CSE (AI & ML)

Vardhaman College of Engineering, Hyderabad, India
Prakashsarangi89@gmail.com

Abstract—In the current world for investing money in the stock market is challenging forum and it also requires a lot of brainstorming. Since financial stock market is volatile in nature. So, it is very difficult to predict. There are some algorithms related to subject like Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL), which can give efficient accuracy compare to other techniques. In this paper, our objective to predict financial stock market price using Deep Learning techniques like Recurrent Neural Network (RNN) and in particular Long-Short Term Memory model (LSTM). Using RNN and LSTM techniques for different datasets, we have to explore the accuracy by increasing number of epochs.

Keywords—Stock Market, Stock Market Prediction, RNN, LSTM

I. INTRODUCTION

The Financial stock market is an important part of our country because it depends up on economic growth of a particular country. For prediction of financial stock market is not simple task. Still many researchers are already published different model to predict future price and also behaviour of financial stock market. Although the prediction chance is 50-50 using manual prediction method, there are some AI, ML, and DL based techniques are predicted the stock market price with better accuracy.

The main objective of our work is to build a model that guides the person to invest in a particular stock in which the there won't be any risk factor. The system uses the data given by that person and then it RNN and LSTM to come up with a solution and here we are also used the plotly dash, the dash we can define it as a python framework. Our model suggests to the person when and where to invest the money to maximize the profits and the risk factor is also less. The database used to analyze the problem and tries to find a suitable solution is already present in the system. There are several Artificial Intelligence, machine learning and deep learning techniques, which are used by different researchers [1] [2]. Here we have planned to make different from them by increasing number of epochs.

II. LITERATURE REVIEW

The prediction of financial stock market price is vital role for different researchers. There are lots of work done by many researchers related to field of AI, ML, and DL. In addition to these models' other approaches also can adopt like Reinforcement Learning etc. Here using this deep learning model, we can predict the future stocks prices but only for the short period of time after that it won't be able to predict [3].

It is because due the complexity errors occurring in the model. They are also explained study stock market price behaviour based on different bioinformatics techniques [4], [5]. There was a survey article which helped us a lot to understand the difference between the different models like HMM, SVM, NLP, CNN etc [6], [7], [8]. Here by researching more and more we came to know that at the beginning of the prediction the researchers used the model called ARIMA which was not quite successful but it helped them a lot on understanding the complications occurring in the prediction of the future stocks [9]. Here we came to know that our model which is built using the RNN and LSTM are the much efficient one to predict the future stock models. The much needed action in the world of trading is an algorithm which predicts the exact output of a given input, many data scientists and data analysts are working day and night only with one aim that is making data easily accessible so that we can store that data and using the long short-term memory the algorithm can easily predict the output.

In this paper, our model work in a pipe line manner, in the section III we have explained our proposed model based on RNN and LSTM algorithm. In the section IV, find the prediction result. Finally in the section V, we have concluded our proposed model and explained try to explore in future using other models.

III. PROPOSED WORK

In this work, our proposed model is based on a pipeline manner. There are some steps to get accuracy of the model. Here output of one step will be input of another step. The details of the steps are explained in below proposed fig. 1.

By using the RNN that is the recurrent neural network the proposed system can extract the historical data and then predicts the future stocks. First of all the system will collect some information from the user such as in what stocks he want to invest his money and how much amount is and how much loss can he bear and also what is the duration of that

investment. After collecting all the information provided by the user the system will apply the machine learning algorithms and then it will give an optimal solution to the user that which stock is safe for him to invest his money for minimizing the risk of loss factor and earning the maximum profits.

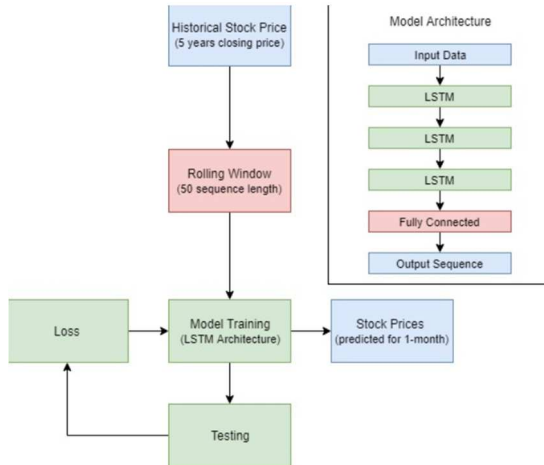


Fig. 1. Proposed Model of our work

A. Gathering the Data

Here the system we have proposed requires some amount of data from the dataset of one of the stock exchanges such as the NSE that is the national stock exchange. In the stock market websites, there are various datasets that are available and these are available the various kinds of format such as the datasets in the monthly format or else in daily format datasets and also in the weekly format also. We have used the daily format datasets is the suitable one, now we should select any one stock exchange and choose the kind of the data format.

Now in this world there are many stock exchange markets available but we have collected for the NSE that is also known as the national stock exchange. In India it is the biggest stock exchange available for the traders of stock, It is also having the biggest online digital exchange in which the users will be getting the option to buy or sell their stocks online without any complicated problems. It is the biggest stock exchange in the entire Asia.

Here the system requires the stocks which will trade on the daily basis format. Those stocks can be chosen that are well established in the market and their periodical graph of close price should be also great and it will be great if the selected stocks are traded constantly. In NSE stocks are divided into number of sectors and each sector will be having 100 of stocks and one stock from each sector will be selected.

B. Long Short-Term Memory

The LSTM algorithm is based on artificial neural network which is a part of artificial intelligence and deep learning. This model based on feed forward neural network model as shown in fig. 2. This kind of RNN can process single data points and also entire sequences of data (such as speech or video). Let us take an example LSTM is applicable in many tasks such as robotic control and speech recognition and many more. The most cited neural network in 20th century was LSTM [10].

We know that RNN has long-term memory and as well as the short-term memory and this analogy refers to the name of LSTM.

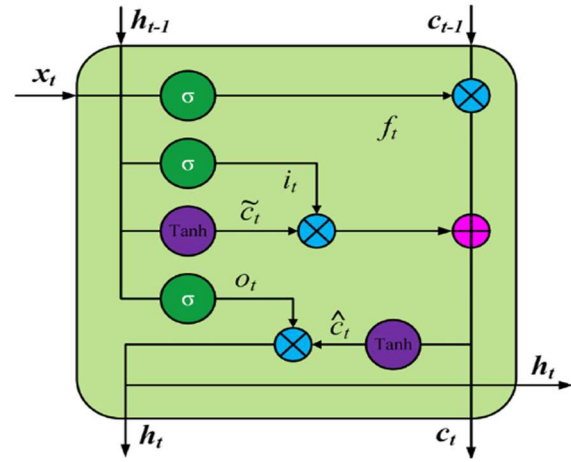


Fig. 2. Internal Structure of the LSTM network

C. Recurrent Neural Network

The RNN is an important model of deep learning techniques which can be commonly used for temporal problems, for example translation of language, processing of natural language, speech recognition, and image captioning as shown in fig. 3.

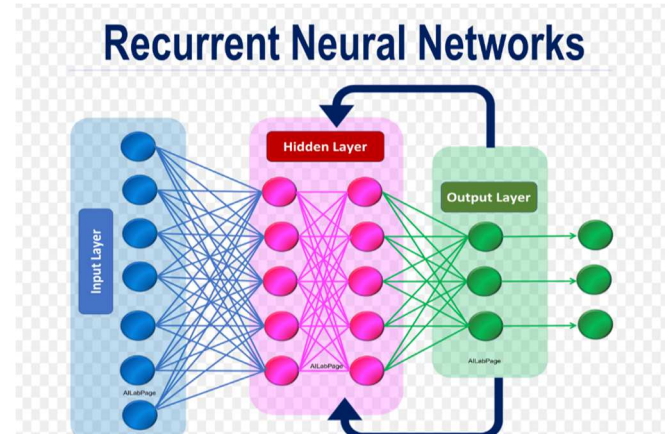


Fig. 3. Overall architecture of RNN

D. Implementation Part

In the above fig. 4, flow diagram is explained about details steps to process our model using LSTM. In the step one, input the historical data set from any sources and filter them. In the second step, these preprocessing date have used for dimensionally reduce using Principal Component Analysis (PCA) to get high weighted features. In next step, divide the entire datasets into training and test data. Choose Tanh activation function and apply LSTM algorithm for prediction of stock market closing price. We have to choose LSTM model with one LSTM layer, this LSTM layer is having 32 units. This is following 1 neuron of one dense layer. In the LSTM model structure in the training part, we have to set 100 epochs with a fit function having batch size of 8.

From the dataset the ratio of splitting between training and testing is 80:20. From the training model result compared with the testing dataset and drawn the prediction accuracy.

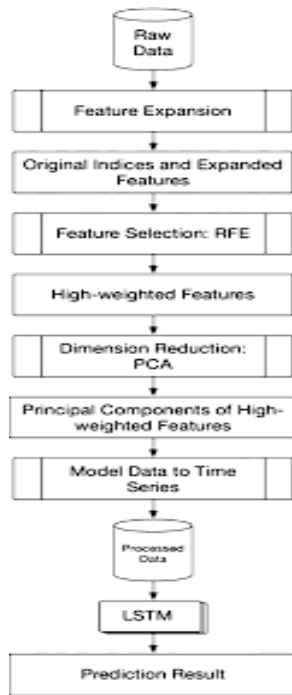


Fig. 4. General Procedure for LSTM algorithm

IV. EXPERIMENTAL RESULTS AND ANALYSIS

For the experimental study, 4 GB RAM, i3 processor, Jupyter note book for python implementations is used. The data sets of different companies like TCS, Microsoft, Infosys, and TATA are collected from yahoo finance.

In this paper, we have taken four companies like Microsoft, Infosys, TCS, and Tata. Then apply all dataset in to LSTM algorithm and drawn some inferences. Fig. 5 indicates actual vs predicted stock closing price of Microsoft stock data. Here X-axis represents sequentially trading days and Y-axis indicated actual and predicted closing price of the stock market. Error rate calculation and comparison with 20 years dataset Mean Absolute Percentage Error (MAPE) is 5.37.

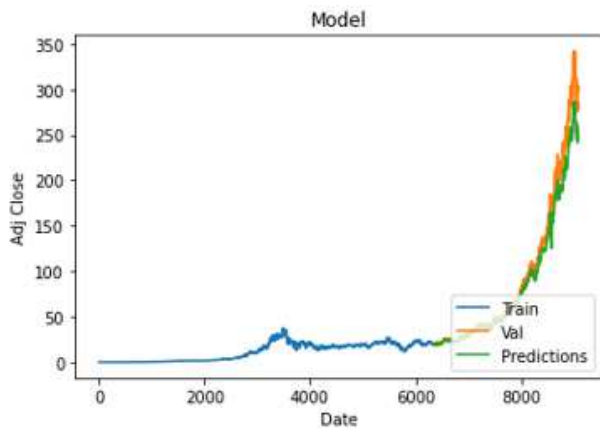


Fig.5. Actual vs Predicted closing price of Microsoft stock data

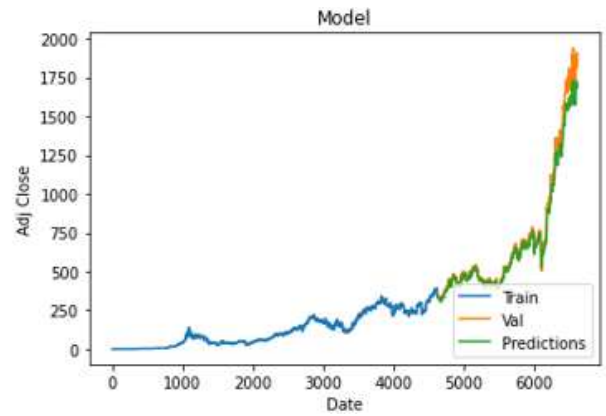


Fig. 6. Actual vs Predicted closing price of Infosys stock data

From the fig. 6 indicates actual vs predicted stock closing price of Infosys stock data. Here X-axis represents sequentially trading days and Y-axis indicated actual and predicted closing price of the stock market. Error rate calculation and comparison with 20 years dataset Mean Absolute Percentage Error (MAPE) is 5.98.

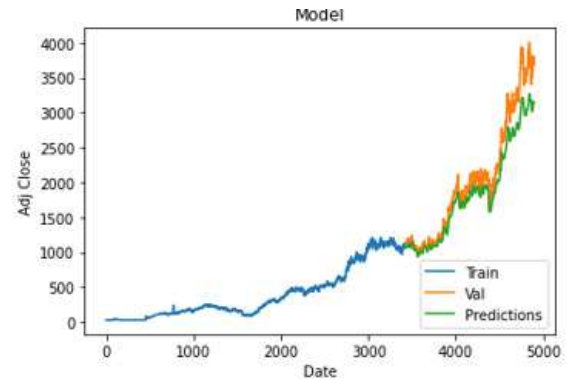


Fig. 7. Actual vs Predicted closing price of TCS stock data

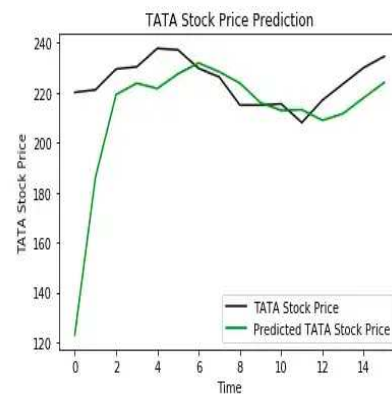


Fig.8. Actual vs Predicted closing price of TATA stock data

From the fig. 7 indicates actual vs predicted stock closing price of TCS stock data. Here X-axis represents sequentially trading days and Y-axis indicated actual and predicted closing price of the stock market. Error rate calculation and comparison with 20 years dataset Mean Absolute Percentage Error (MAPE) is 3.06.

From the fig. 8 indicates actual vs predicted stock closing price of TATA stock data. Here X-axis represents sequentially trading days and Y-axis indicated actual and predicted closing price of the stock market. Error rate

calculation and comparison with 20 years dataset Mean Absolute Percentage Error (MAPE) is 4.14.

V. CONCLUSION AND FUTURE WORK

The financial stock market trading is very much popular in national and international level. For this reason, it is also encouraged to researchers for doing research in this particular field by using different techniques to predict future stock market price and its behaviors. The main objective is providing better accuracy by comparing with other techniques. In our work, two models RNN, and LSTM are used. The database sample which we have chosen for our system worked perfectly for the system and every sector behavior was also represented in the correct way and this shows that our built model is huge success. The forecasting algorithms such as the LSTM and RNN also forecasted the closing price of one quarter year exactly. Since stock market is very volatile in nature in one dataset we are getting nearly 97 % accuracy. In future different machine learning models and deep learning models can be implemented with same dataset.

REFERENCES

- [1] Moghar, Adil, and Mhamed Hamiche. "Stock market prediction using LSTM recurrent neural network." *Procedia Computer Science* 170 (2020): 1168-1173.
- [2] Reddy, V. Kranthi Sai, and Kranthi Sai. "Stock market prediction using machine learning." *International Research Journal of Engineering and Technology (IRJET)* 5.10 (2018): 1033-1035.
- [3] Sarangi, Prakash Kumar, Birendra Kumar Nayak, and Sachidananda Dehuri. "A Compression-Based Technique for Comparing Stock Market Patterns Behavior with Human Genome." *International Journal of Engineering Science and Technology* (2012): 0975-5462.
- [4] Sarangi, Prakash Kumar, Birendra Kumar Nayak, and Sachidananda Dehuri. "Stock Market Price Behavior Prediction Using Markov Models: A Bioinformatics Approach." *Data Analytics in Bioinformatics: A Machine Learning Perspective* (2021): 485-505.
- [5] Sarangi, Prakash Kumar, Birendra Kumar Nayak, and Sachidananda Dehuri. "A Novel Approach for Prediction of Stock Market Behavior Using Bioinformatics Techniques." *Data Analytics in Bioinformatics: A Machine Learning Perspective* (2021): 459-484.
- [6] Sarangi, P. K., and B. K. Nayak. "Stock market behavior prediction using pattern matching approach." *International Journal of Engineering and Computer Science (IJECS)* 3 (2014): 2319-7242.
- [7] Mohapatra, Srikanta Kumar, et al. "Text classification using NLP based machine learning approach." *AIP Conference Proceedings*. Vol. 2463. No. 1. AIP Publishing LLC, 2022.
- [8] Sahu, Premananda, et al. "Detection and Classification of Encephalon Tumor Using Extreme Learning Machine Learning Algorithm Based on Deep Learning Method." *Biologically Inspired Techniques in Many Criteria Decision Making*. Springer, Singapore, 2022. 285-295.
- [9] Bamunif, Abdullah Omar Ali. "Sports Information & Discussion Forum Using Artificial Intelligence Techniques: A New Approach." *Turkish Journal of Computer and Mathematics Education (TURCOMAT)* 12.11 (2021): 2847-2854.
- [10] Verma, Akhil. "Encryption and decryption of images based on steganography and cryptography algorithms: a new model." *Turkish Journal of Computer and Mathematics Education (TURCOMAT)* 12.11 (2021): 2839-2846.