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Prediction of Share market Price using Machine Learning and Deep Learning Technique

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Abstract *– Stock Market has started to attract more people from academics and business point of view which has increased. So this paper is mostly based on the approach of predicting the share price using Long Short Term Memory (LSTM) and Recurrent Neural Networks (RNN) to predict the stock price on NSE data using various factors such as current market price, price-earning ratio, base value and some miscellaneous events. We use a numerical data and recommended data for a company selected from collaborative and content based recommendation system. So this paper is all about selecting the company based on the recommendation system using collaborative and content based on selecting a company for the machine learning model based on the LSTM and RNN method. The performance of the model is displayed by comparing the company data and the predicted data using a RNN graph.*

Keywords: ***Long Short Term Memory, Recurrent Neural Networks, Backpropagation, CNN-sliding window, Stock Market, Stock Price,stock exchange***

I. INTRODUCTION

The trend of predicting the stock have been one of the hot topics among the community where studies in various field where machine learning is one among them. We know that Machine learning techniques are very popular in building real-time application model which provide better result than other methods. This paper proposes a method of predicting stock price based on LSTM and RNN methods used within taking a set of companies from nse,bse data and train the model with the historical data and also real time data where the model gets trained and we get better results as expected and can invest on the company to gain profit or use the model to educate academics how this model can help the students in increasing the chances of predicting some data based on this model [4].

Many methods have been developed to predict the stock market related data using various techniques and models where they have used sentimental, past prices, sales growth and dividends we know that to predict the stock efficiently we need data along with one of the above factor where we can build the efficient market hypothesis where major companies are investing their money into we selected machine learning with other techniques just because they give us the better results than the other random prediction model. Supporting vectors in machine learning can provide the classification and regression for the model and few other trending models such as linear regression, Artificial neural network, etc.

Data collection is very important in this aspect as we rely on the data very much as we know predicting the stock market data. So data must capture based on the model if we are predicting for intraday trading then we have to capture the data every minute or so that we can train the model in real time. If we are trying to predict swing, positional and options strategies then we have to collect the data based on that.

The study is fully focused on few strategies mentioned. Take the set of data from NSE ,BSE India based on the time-gap where we filter the company based on the conditions such as base value is greater than or equal to current market price. Then we get the set of companies projected by the experts through the media and websites promoting them to do better and then provide the data into to the machine learning model and train the model and predict the stock price. So finally stock market price prediction on the dataset demonstrate that our model is effective and show that this model work efficiently than other methods.

II. RELATED WORK

There are multiple work going in this area with various strategies and models few of the closely relative methods are by using CNN-sliding window with RNN and LSTM model where they try to predict the stock price by using both linear and non-linear model of vector[1][2]. Whereas it's not about fitting the data into the model but identifying the latency of the dynamics of the data present using the deep learning model in this method they have tried to implement the model using the strategy for 3 companies Bajaj,Wiproand

Myra by defining the weights and the hidden units given by the equation below.

$$n^s = m(n^{s-1}, y^s, Ø) \quad (1)$$

Then using the LSTM and RNN they form the model to train the architecture and predict the data and the accuracy of the method is very near close in few tests and can be reliable to predict the stock price using this method [1]. Where they form gates and decides which information to pass and which not to pass and calculate the error percentage by the given formula below.

$$ty = (mno\ [Z^i\ Real - Z^i\ Predicted] \div Z^i\ Real) * 100 \quad (2)$$

It follows the methodology of data model then predict and finally error calculation where there are few more works gone across this field using various other different methods using deep learning using text based method also using the numerical and both using RNN, LSTM and few other mechanism.

III. MODEL AND METHODOLGY

We know that stock price can be represented based on time series of given length NN, Defined as Q0, Q1, Q2…..Q M-1Q0,Q1,….QM-1 in which QiQi in eqn. 3 and eqn. 4 can be closed price for the day i_i, $0 \leq i < M0 \leq i < M$. Then next is that we have declare the imagined window of sliding window of fixed size Ww which then be declared as the Input size for the program and everytime we move the sliding window there is no overlap between the sets of data [7](Fig 1).

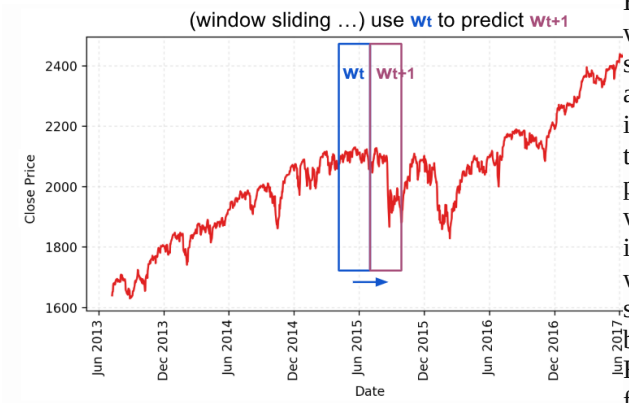

Fig 1 Sliding window example where it helps to predict the next price [7]

The model which we are using has the LSTM cells and the model is RNN now let's form the input structure to provide the machine learning part to train the model taking the first sliding window and time as Wt for time t and W0 for window.

$$W_0 = (P_0, P_1 \ldots P_{w-1}) \quad (3)$$

$$W_1 = (P_w, P_{w+1 \ldots} P_{2w-1}) \quad (4)$$

$$W_n = (P_{tw,} P_{tw+1} \ldots P_{(t+1w-1)}) \quad (5)$$

To predict the future price for the following window wt+1wt+1:

$$W(t+1) = (p(t+1)w, p(t+1)w+1, \ldots, p(t+2)w-1) \quad (6)$$

By learning then we come to an approximate function as follows,

$$f(V0,V1,\ldots,Vt) \approx Vt+1 f(V0,V1,\ldots\ldots Vt) \approx Wt+1 \quad (7)$$

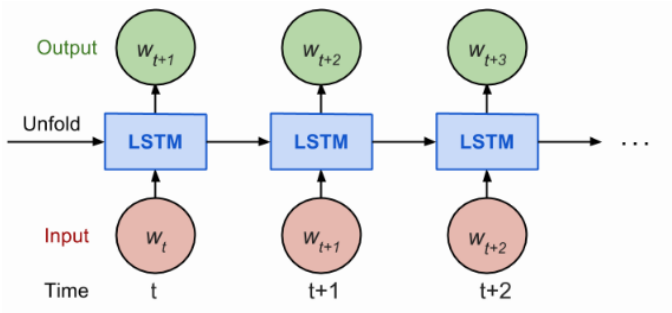

Fig. 2 Backpropagation through time [3]

BPTT which is Backpropagation through time which we use can usually train RNN in unrolled manner[6] so that we can avoid the far backpropagation and avoid training complication because it depends on the input which might come in the arbitrary distant time[Tensorflow guide]. We combine the sequence of price to be split into a non-overlapping windows which are small contains size and counted as an independent input element and also number of steps where consecutive elements are grouped based on the size forming an unrolled version of data which could be fed to train the model on tensorflow[8].

For example, if input_size=3 and num_steps=2, our first few training example could come up as:

Input value1=[[p0,p1,p2],[p3,p4,p5]], Task 1=[p6,p7,p8]
Input value 2=[[p3,p4,p5],[p6,p7,p8]], Task 2=[p9,p10,p11]
Input value 3=[[p6,p7,p8],[p9,p10,p11]], Task 3=[p12,p13,p14] [11]

As we have to predict the future data then we have to take at least 10% of the previous data to train the model to get the best prediction possible, we have to normalize the model for the values which are out of scale input we will see that the prediction going down compared to the actual graph as shown in the figure 3. [10] To solve this scale-out issue we have to normalize the sliding window with where Wt be the normalized sliding window at time tt, all those values are divided by the last unknown price and the equation at time Wt-1 is given by eqn. 5

W't = (ptw / ptw-1, ptw+1/ptw-1,…,p(t+1)w-1/ptw-1) (8)

Fig. 3 shows the implementation of the model and the flow of execution where provide the input vectors where we transpose the data according to the size forming group and then loading the data on to the RNN model to train where we use LSTM to correct the data for the long term prediction as they help to adjust the error and also use backpropagation to avoid scale out factor then we finally get the output and train that values to predict the future and compare the result to learn [9].

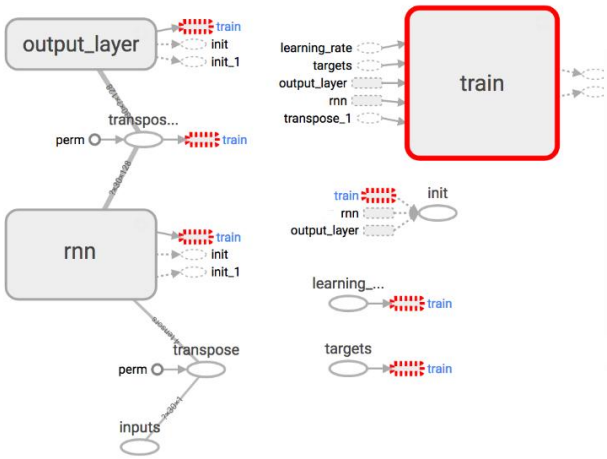

Fig. 3 RNN Model Build [5, 8]

IV RESULTS AND DISCUSSION

The following is the configuration used to conduct the experiment the model. The configuration for the experiment is given in Table 1. We train all the stock price of NSE data of last 24 months and check the result here we are going to discuss result obtain by SP500 where the data display the result for the past 200 days with the predicted value where we can compare with the actual data as shown in the Fig. 4 with lstm_size 32 and input_size 1, Fig. 5 with lstm_size 128 and input_size 1 Fig. 6 input_size 5 lstm_size 128 and max_epoch 75 (instead 50).

Input Data	Input Value
No. of Layers	1
Learning Rate Decay	0.99
Initial epoch	5
Max epoch	100
Num. of Steps	30
Keep Probability	0.8
Batch Size	64
Init Learning Rate	0.001

Table 1 Default Configuration

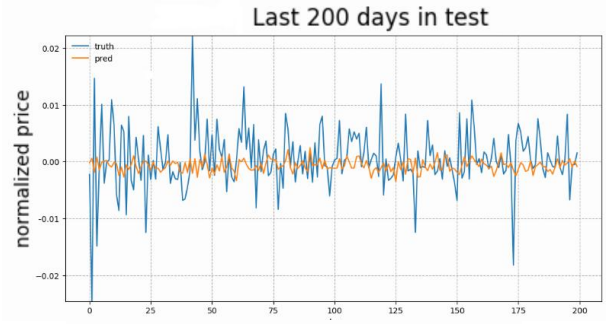

Fig. 4 Model Trained for input_size=1 and lstm_size=32

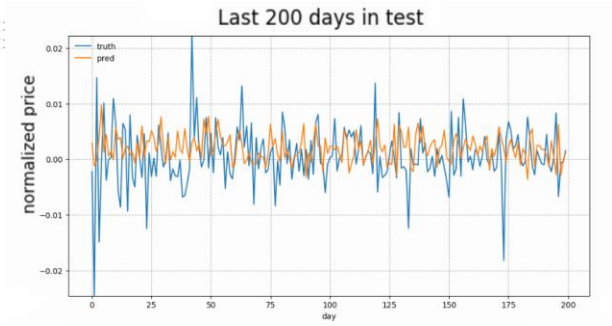

Fig. 5 Model Trained for input_size=1 and lstm_size=128

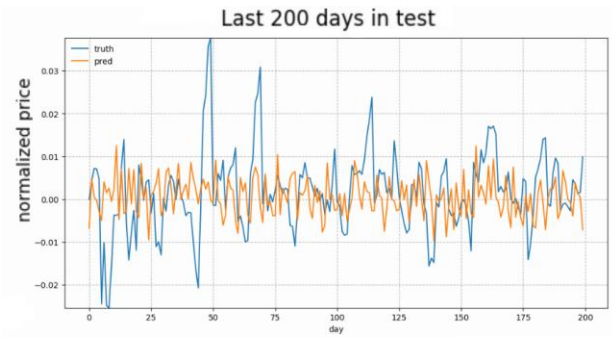

Fig. 6 Model Trained for input_size=5 and lstm_size=128 and max_epoch=75

We can observe that the model gets efficient as we improve the configuration and set them according to the environment we observe in Fig 4 that with less lstm_size the error is more and the prediction is not efficient when compared to the increased lstm_size in Fig. 5 we can still improve the prediction efficiency by increasing the max_epoch so from this we can conclude that the model gets efficient by understanding the nature of the model and setting the model with the proper configuration to predict the model.

V CONCLUSION

We recommend machine learning to predict stock price as we see the result able to predict the stock price very close to the actual price where this model captures the hidden feature and uses various strategies to make prediction. We train the model for all the NSE data from the their web and identified the input and group them and provide input according to the user configuration this RNN based architecture proved very efficient in predicting the stock price by changing the configuration accordingly which also use 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 can change day to day in this type of analysis sector but proper analysis will provide a greater profit so we have to use analytical strategies such as LSTM RNN and Backpropagation on the current information [13]. We indebted to the Chancellor,vice chancellor&registrar of Reva University, Bangalore for excellent support in completing this work at the right time, and also for providing the academic and research atmosphere at the University. A special thanks to the authors mentioned in the references.

REFERENCES

[1] J. Schmidhuber and S. Hochreiter, “Long short-term memory,” Neural Comput., vol. 9, no. 8, pp. 1735–1780, Nov. 1997.

[2] A. Graves, Supervised Sequence Labelling with Recurrent Neural Networks, ser. Studies in Computational Intelligence. Springer, 2012, vol. 385.

[3] Cheshire Engineering Corporation, "Basic Concepts for Neural Networks” V1.4 2001, Copyright © 1994 Cheshire Engineering Corporation

[4] Y. Singh and A. S. Chauhan, "Neural Networks in Data Mining," Journal of Theoretical and Applied Information Technology, pp. 37-42, 2009.

[5] Predicting Stock Price using RNN by Lilian Weng, Unpublished.

[6] A. V. Devadoss and T. A. A. Ligori, “Forecasting of stock prices using multi layer perceptron,” Int J Comput Algorithm, vol. 2, pp. 440–449, 2013

[7] H. Jia, “Investigation into the effectiveness of long short term memory networks for stock price prediction,” arXiv preprint arXiv:1603.07893, 2016.

[8] Sreelekshmy Selvin, Vinayakumar R, Gopalakrishnan E.A, Soman K.P and Vijay Krishna Menon “Stock Price Prediction Using LSTM,RNN and CNN-Sliding Window Model” DOI: 10.1109/ICACCI.2017.8126078

[9] S. Hochreiter and J. Schmidhuber, “Long short-term memory,” Neural computation, vol. 9, no. 8, pp. 1735–1780, 1997.

[10] A.J.P. Samarawickrama and T.G.I. Fernando, A Recurrent Neural Network Approach in Predicting Daily Stock Prices. 978-1-5386-1676-5/17/$31.00 ©2017 IEEE

[11] A. Pannetrat, R. Molva. "Authenticating real time packet streams and multicasts", Proceedings ISCC 2002 Seventh International Symposium on Computers and Communications, 2002.

[12] Sreelekshmy Selvin, R Vinayakumar, E. A Gopalakrishnan, Vijay Krishna Menon, K. P. Soman. "Stock price prediction using LSTM, RNN and CNN-sliding window model", 2017 International Conference on Advances in Computing, Communications and Informatics (ICACCI), 20