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Stock Price Prediction using LSTM

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Abstract: ***The movement of stock prices is non-linear and complicated. In this study, we compared and analyzed various neural network forecasting methods based on real problems related to stock price demand forecasting. We ultimately selected the LSTM (Long Short-Term Memory) [1] neural network as traditional RNN's long-term reliance is improved by LSTM, which substantially enhances prediction accuracy and stability. The practicality of this method and the pertinence of the model are then inspected, and final conclusions are drawn through a detailed examination of stock price forecasts using LSTM neural networks optimized by RNN algorithms. Past information has proven to be extremely predominant to investors as the basis for financing resolution. Previous studies have used open and close prices as vital predictors of financial markets, but utmost highs and lows may provide extra information regarding future price actions. Hence, two representative stock indexes of the Indian stock market were selected for the survey, and the main data collected from them are open, closed, lowest, highest, date, and everyday transaction size. The outcome shows that the LSTM model has few restraints, including a forecast time lag, but you can use the attention level to foretell stock prices. Its primary idea is to analyze stock market historical information and find the role of time series by digging deeper into its central rules.***

Keywords: LSTM, Neural Network, Prediction, Stock Price.

I. INTRODUCTION

A stock exchange is where shares are bought, transacted, transferred, and distributed. However, the issuance of the stock provides a legitimate and efficient channel of cash flow, allowing a large amount of inactive money to be collected in the stock market [1]. Such productive fundraising can enhance the financial viability of a business and help in financial growth. Furthermore, the spread of stock enables successful fundraising and fundraising is effectively promoted. In conclusion, the stock market is generally reviewed by specialists as an matriculate measure of the financial growth of a nation over a period of time. However, because of the complexity, variability, and uncertainty of the stock market, the stock price structure presents features of complexity and unpredictability [2]. Stock prices are boundless to the political, economic, market, technological, and behavioral characteristics of investors such as individual characteristics, which are influenced by various factors in the interaction between roles at the same time, this will lead to changes in stock prices, stock availability. various uncertainties lead to the problem of stock price fluctuations [2]. Ongoing modifications in stock prices to provide a breeding ground to be considered in the financial market. Investors and human analysts tend to be "irrational", relying on personal experience and intuition to make decisions and determine that there is a certain limit, i.e., through experience and intuition to predict stock prices is inaccurate, this is not accuracy under directing related behaviors poses significant risks, can lead on economic losses for investors. Therefore, the method of accurately analyzing, judging, and predicting stock prices for shareholders to make decisions is extremely crucial. In this project, we are going to make a stock dashboard that will help the user to visualize stocks on the basis of technical indicators. These indicators will give a proper overview to the stockholders whether to buy the stocks regardless of the stockholder knowing the history of the company. These technical indicators will determine the strength, trends, and seasonality of a stock based on the price of the stock. We will also use Machine Learning models in the project which will train the model to predict the stock's value based on the time series. We will try to implement the following models in the project to predict stock values.

1. Deep Neural Networks (DNN)
2. Recurrent Neural Networks (RNN) [2]
3. Long Short-Term Memory (LSTM) [1]

In-depth learning based on neural networks has attracted widespread attention from experts in the field of deep learning. The neural network is a complex dynamic nonlinear system, therefore, any other way that can deal with the low efficiency of complex and indirect systems can be through the neural network method [2]. This approach is distinguished by managing a distinctly consistent approach, the performance of the topological structure is highly adaptable, the ability to work extremely dynamic, non-linear performance is fast and the ability to self-study. This approach is being considered in the research field.

II. PROPOSED FRAMEWORK

This paper proposes a short-term memory model based on attention to foretell stock prices. The model consists of four parts: a hidden layer, input layer, output layer, and layer of attention. The input layer cleans input data to meet model input conditions.

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The encrypted layer is attached to the network model by the LSTM unit. The attention layer measured the feature vector. The resulting layer receives a computed response. Model training is resolved with a gradient drop algorithm.

A. Input Layer

(1) Take the date, closing price, opening price, maximum and minimum price of the stock as input data to build a time series; (2) divide the input data into a test set and training set according to the ratio of 3:7; (3) transform all components of input data into the interval [0,1] after standardization [2].

B. Hidden Layer

The hidden layer is created by the LSTM unit, which is afflicted by the input data of the present moment and the preceding moment [2].

C. Attention Layer

By calculating the weights of the input information in the attention layer, the model can choose and grasp the input data. The higher the weights acquired by the model training, the closer the input data is to the target value [2].

D. Output Layer

After the completion of the modeling training, the stock time series is entered for forecasting, the stock information is entered into N days to predict stock trends on the N + 1 day. The trained model uses the trading information for the first four trading days to predict the closing price of the fifth trading day[2].

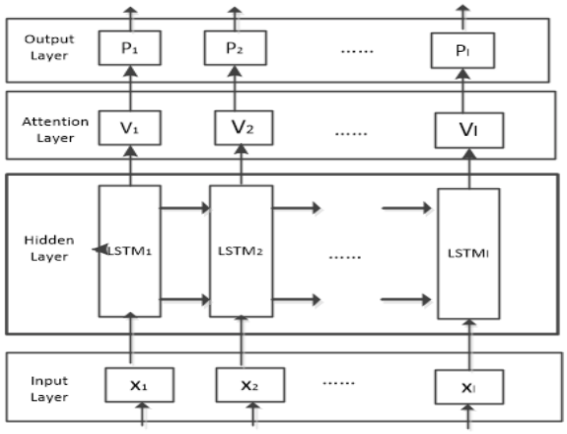

Fig. 1 Proposed Framework [1]

III. PROBLEMS IN TRADITIONAL STOCK VISUALIZATION MEDIUM

1. Lack of technical indicators for predictive analysis: In traditional stock market visualization media, like newspapers, television, etc. there are no technical indicators to show trends in stock values.

2. Slow and inaccurate calculations with respect to technical indicators: A lot of calculations are needed to be done quickly with respect to the technical indicators, which is not possible for humans. The calculations done by humans on the basis of technical indicators are not precise.

3. Huge amount of data to be computed for prediction purposes: In the traditional system, predictions are done by humans. In order to do so, people will have to compute years of data in order to predict future prices and computing a lot of data at once without any flaw is beyond the limit of humans. Also, the errors in computation may affect the result causing a decline in profit.

4. Difficulty in visualization: In the traditional system, information regarding stocks is available through news channels, newspapers, and magazines which will only provide us with the stock prices. Hence visualization of stocks is difficult unless a CGI (Computer Graphic Interface) is being used.

IV. PEOBLEMS WITH EXISTING ONLINE DASHBOARDS

1. Lack of efficiency: For prediction purposes, a lot of information is to be processed. The efficiency of the prediction depends on the quality of the data set.

2. Lack of options for customization: Since people don't use all the available technical indicators online, they'd prefer customizing them to their needs. Most of the other online stock dashboards cannot be customized for this purpose. Also, they'll have to pay an enormous amount of money in order to do so.

V. REQUIREMENTS SEPCIFICATION

Our project aims to minimize the problems caused by traditional means of stock trading. Since graphs will be used, visualization will be way easier and better. It will be easier for people to understand the stock pattern. Prediction and visualization are not a common combination in most other websites. In our project, there will be both, prediction and visualization. Customizing the technical indicators according to the user's needs is available. In this way, they won't have to spend lots of money just to customize. News related to company stocks will also be available in our project. Since we are using time series for prediction purposes, we will be dealing with a lot of historic data resulting in a better prediction rate.

VI. EXPERIMENT

A. Unprocessed Data

Trading date, opening rate, closing rate, minimum rate, maximum rate, and daily stock volume are selected as the input parameters of the model. The input is searched in the public information of the NSE website using the search engine and placed on the stock website after a material purification process such as zero value and invalid value removal.

B. Normalization of Data

Because the vector of a model element has five sizes over time, and its location is different, it has different sizes and order size, usually the stock trading volume of orders over the stock value, if not by the input set is used directly indicators were analyzed, and the order of the large trading volume indicator on the model would be outstanding, and the order of magnification of the small trading volume indicator on the model would be normal.

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As a result, five eigenvectors other than time must be standardized in order to verify the result's dependability. The maximum and minimum methods are used to standardize input in this research, and the formula is as follows: (original input - minimum)/ (maximum - minimum) Equals standardized input data. The opposite performance of standardization processing is required to assure the uniformity of the business meaning of input and output. These two aspects of the operation are enshrined in the software, which ensures that they are completed automatically.

C. Training Specifics

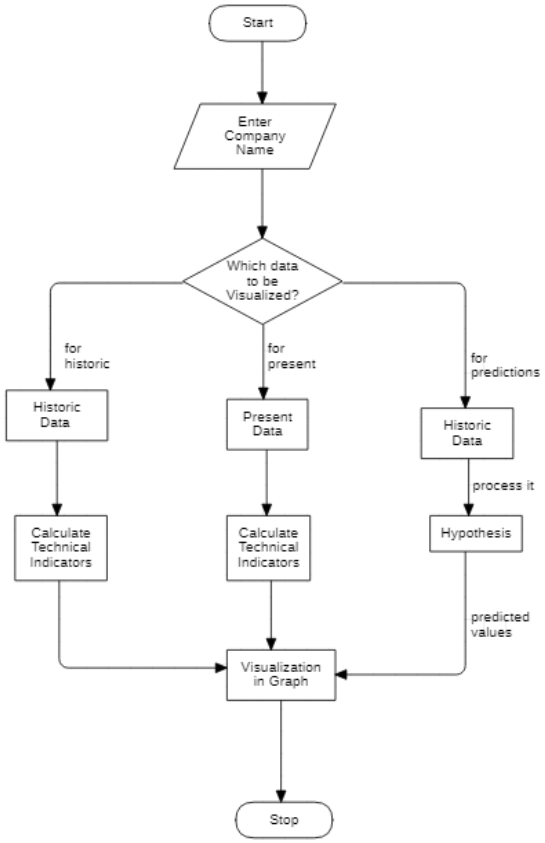
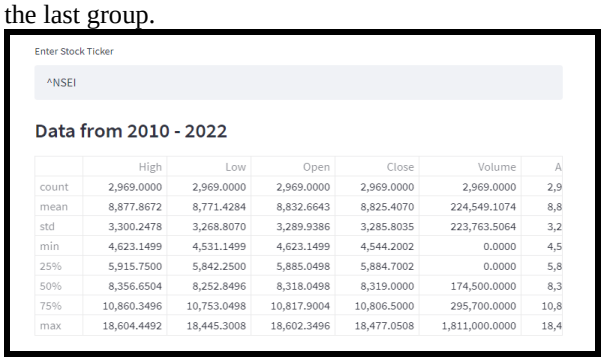


Fig. 2 Proposed Framework

We used mini-batch gradient descent to train the model, with a learning rate of 0.001. We employed a 64-piece mini-batch size, and we used the mean and standard deviation of each stock derived from the training set to normalize each vector in a sequence. As a training platform, we employed a PC server, Cent-OS 7, and Tensor-flow like the deep learning platform. One epoch lasts around 2000 seconds.

VII. RESULTS

This article has proposed a combination of four-way attentional models in which the duration of different exit test data and actual value is closed, but also in different stock indicators, no significant differences between model predictor outcomes. The return of the model has oscillatory behavior in the scene with a temporary window, and a higher predictable value and index time delay compared to the actual value. As shown in the figure, the predicted blue value is longer compared to the actual red value in the two short-term input groups. The predicted time delay will affect the validity of the model, but as the duration of the input grows, the delay will eventually reduce. The time-time correlation among the predicted value and the actual value will be verified literally in the last group.


Enter Stock Ticker

^NSEI

Data from 2010 - 2022

	High	Low	Open	Close	Volume	A
count	2,969.0000	2,969.0000	2,969.0000	2,969.0000	2,969.0000	2,9
mean	8,877.8672	8,771.4284	8,832.6643	8,825.4070	224,549.1074	8,8
std	3,300.2478	3,268.8070	3,289.9386	3,285.8035	223,763.5064	3,2
min	4,623.1499	4,531.1499	4,623.1499	4,544.2002	0.0000	4,5
25%	5,915.7500	5,842.2500	5,885.0498	5,884.7002	0.0000	5,8
50%	8,356.6504	8,252.8496	8,318.0498	8,319.0000	174,500.0000	8,3
75%	10,860.3496	10,753.0498	10,817.9004	10,806.5000	295,700.0000	10,8
max	18,604.4492	18,445.3008	18,602.3496	18,477.0508	1,811,000.0000	18,4

Fig. 3 Data set for Nifty 50

Fig. 4 Nifty 50 Index For 10 Years

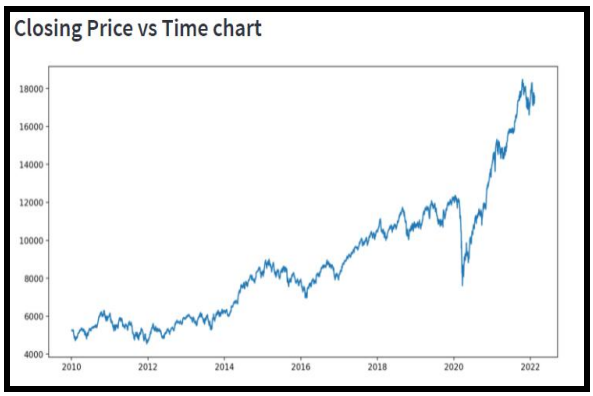


Fig. 5 Closing Price vs Time Chart

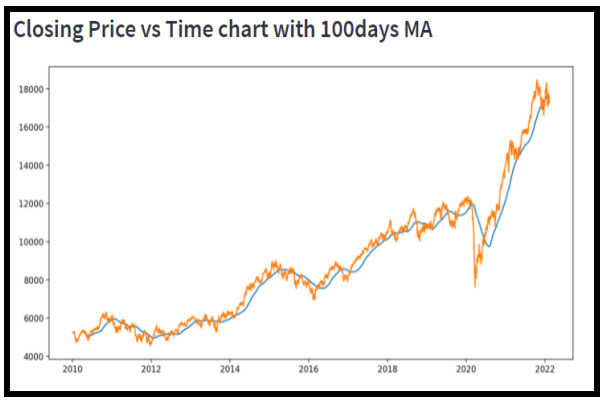


Fig. 6 Closing Price Vs Time Chart With 100 Days Moving Average

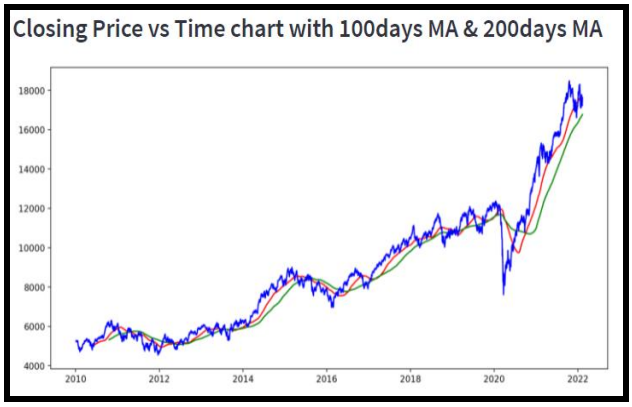


Fig. 7 Closing Price Vs Time Chart With 200 Days Moving Average

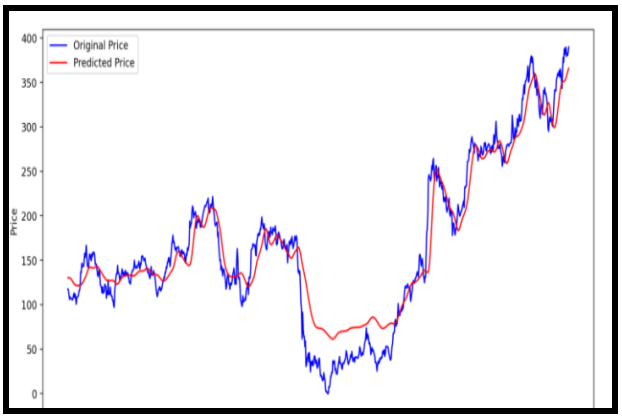


Fig. 8 Predicted Price Chart For SBI

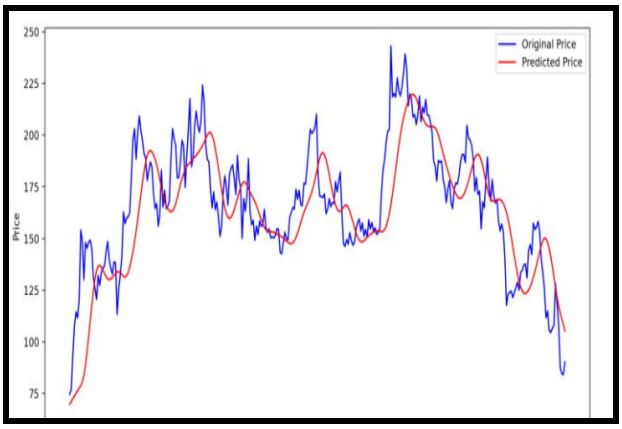


Fig. 9 Predicted Price Chart for Piramal Enterprise Ltd.

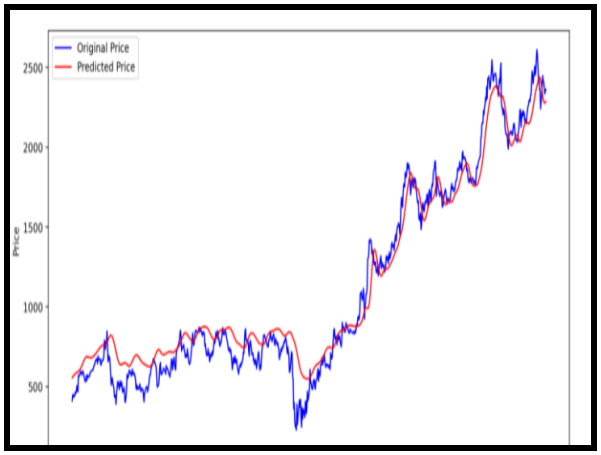


Fig. 10 Predicted Price Chart For TCS

VIII. CONCLUSION

In this paper, to predict stock prices based on the LSTM deep learning model of the attention mechanism and representation of the Yahoo finance dynamic dataset was performed on the feasibility analysis and verify the efficacy of the algorithm, the innovation of this article point can be encapsulating as the following two aspects [2]:

(1) Attention-focused approach along with neural network, this paper proposes a model for predicting stock trends Attention - LSTM, memory pattern and opening price, high price, closing price as variation of model input, hidden coverage and post-calculation, predicting closing price of in-depth stock learning model on the next trading day [2].

(2) In the Attention-LSTM algorithm, a small batch gradient drop algorithm was used to develop the model in the form of a small repetitive step used by the batch gradient drop algorithm, so that the model matched the fast value with a small error [2].

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