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Stock Price Prediction Using Machine Learning & LSTM

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ABSTRACT: Stock price prediction is the most frequently used in the financial industry. The prediction of stock value is a difficult task that requires a strong analytic background in order to calculate longer-term share values. Predicting stock prices is challenging due to the volatility nature of the stock market. The suggested algorithm uses market data to anticipate share price using machine learning techniques such as Long Short Term Memory (LSTM), a recurrent neural network. Stochastic gradient descent is used to correct weights for each data point in the process. Compared to stock price predictor algorithms that are already available, our system will give results that are more accurate. The network is assessed and trained on a range of input data sizes in order to drive the graphical results.

KEYWORDS: Machine Learning, Stock Price Prediction, Long Short Term Memory, Stock Market, Artificial Neural Network.

I. INTRODUCTION

The technique of predicting a company's future trends and deciding whether the value of its stocks will increase or decrease is known as stock market prediction. Shares in companies are exchanged on the stock market. A stock is a type of investment for institutions that signifies ownership of a business. The stock market is the location where those stocks are bought. Buying stock in the company involves buying a minor stake in a company.

As mentioned in [7], the stock market is a turbulent place where there is a need for an abundance of analyses based on past data. The historical time series stock data is used by the prior stock trend forecast algorithms. The statistical examination of stock data is the main focus of standard scientific stock price forecasting methods. This works to construct a stock data predictor program that use historical stock prices. The program will use data as training sets to predict the stock prices of specifies by developing a process.

This model uses the RNN (Recurrent Neural Network) approach known as Long Short Term Memory (LSTM) and takes into account the previous equity share price of a company pricing. The suggested method makes predictions about a specific feature by taking into account the share's historical data that is currently available. The opening price, day high, day low, closing price, day of trading, total trade quantity, and turnover are the properties of shares. The suggested model forecasts a share price for the necessary time period by using time series analysis. The planned would take into account the National Stock Exchange of India Limited (NSE), an Indian stock exchange corporation. The company in charge of the Indian stock market is the National Stock Exchange (NSE). It was the first in the nation to offer investors located all over the nation the most up-to-date and contemporary facilities. It is incredibly contemporary and equipped with the newest features, giving investors the ability to trade from any location in India. This is a key factor in the reform of the Indian equity market, which will improve the capital market's efficiency, convergence, and transparency.

According to [3] Recurrent Neural Networks (RNNs) with Long Short Term Memory (LSTM) are one kind of RNN that can handle linear issues. One method for deep learning is LSTM. Learning extremely lengthy sequences is required of lengthy-term Memory (LSTM) Units. This is the gated recurrent system in a broader sense. Since LSTMs address the evanescent gradient problem, which is possessed by RNN and traditional feed forward, they are less harmful than other deep learning techniques [10].

II. RELATED WORK

The information regarding stock market prediction systems that are currently in use is taken into consideration when doing the literature review.

Based on financial index data, RautSushrut et al.[2] proposed using supervised learning classifiers to forecast stock price movement and ascertain their capacity. Portfolio modelling has been a computational analytical approach used in the financial industry. A discussion of the statistical AI methodology has been covered; the study has demonstrated the use of SVM methodology and the application of tactical approaches for stock price prediction.

Long Short Term Memory (LSTM) networks are a sort of recurrent neural network (RNN) that can solve in volute linear problems. Manoj S. Hegde et al.'s investigation[3] also looked into use of RNNs to predict share values.

According to M. Roondiwala et al. [4], the most widely used RNN architecture is the long short term memory. LSTM creates a memory cell, a processing device that takes the place of traditional artificial neurons in the secret network layer. By using memory cells, network are able to link memory and remote input in real time, which makes them suitable for dynamically capturing data structure over time with a high predictive limit. The article also demonstrates that NIFTY50 shares can be used for stock prediction. One of the most important steps in the process is gathering data. After that, our model must be trained, and the algorithm must be tested using various data sets. We shall go over our process in the upcoming sections.

The stock market's volatility, according to Loke.K.S et al.[7], is an area that requires extensive investigation based on past data. Conventional stock trend prediction. While traditional technical forecasting methods for stock prices are based on statistical data analysis, algorithms use historical time series stock data. The author of the paper also discussed the developments and advancements in the process of predicting stock prices using AI and Machine Learning methodologies. Since there is currently no universally applicable solution and a lot of research is being done to find an accurate model to predict stock prices, historical share data will be taken into consideration for stock price prediction.

A model proposed by Tao Xing, Yuan Sun , et al.[9] uses an RNN approach known as Long Short Term Memory and takes into account the previous equity share price of a firm pricing. The suggested method applies prediction on a certain attribute while taking into account the share's historical data that is currently available. The opening price, day high, day low, closing price, day of trade, and prior day's price are the attributes of shares. The suggested model forecasts a share price for a given time period using time series analysis.

According to Jordan Prosky et al. [10], one way to use sentiment analysis to stock prediction is to use CNN's techniques and their application in stock prediction.

As X. Shao and D. Ma [11] pointed out, it's a broader variant of the gated recurrent system. Compared to other deep learning techniques like RNN, LSTM is less harmful alternative to conventional feed forward neural networks, as LSTMs address the evanescent gradient problem that RNNs have. It is also discussed how to employ LSTM in conjunction with K-means algorithms for short-term stock predictor systems.

In the field of machine leaning, AI and machine learning models can be used to predict stock prices. Utilizing the SVM model to forecast stock prices. One machine learning method that focuses on classification algorithms is SVM. It is employed to obtain a fresh text as a result. Mukt Shabd Journal: Using Multiple Linear Regression with Interactions, Volume X, Issues VI, June 2021, ISSN 2347-3150 forecast the direction of stock price trends (Osman Hegazy et al., 2013 [20]; V Kranthi Sai Reddy, 2018 [12]; Banerjee et al., 2020 [14]; Lufuno Ronald Marwala, 2014 [13]). Page No.: 436. The Random Walk Hypothesis, put out by Horne, J.C. et al. 1997 [19], is used to forecast stock prices. According to Horne, J.C. [19], stock values fluctuate randomly and historical price values are independent of present values. The Efficient Market Hypothesis (EMH) differs from the Random Walk Hypothesis in that it primarily utilizes short-term patterns to forecast stock values.

A recurrent neural network is used in the LSTM technique to encode data. The program uses headlines from economic news stories as inputs from Reuters and Bloomberg. In the stock market, Long Short-Term Memory with an automatic encoder and an embedded layer are used to anticipate stock values. The Pang Xiongwen et al. [18], used an embedded layer and automatic encoder to vectorize the values using LSTM layers. Stock correlation coefficients are chosen at random and forecast using ARIMA and a neural network technique. RNN and LSTM algorithms are used in this. El et al., M. Nabipour [17], used a variety of deep learning and machine learning technologies, including neural networks, decision trees, and random forests, to predict stock values. The most accurate findings are provided by LSTM, which

also fits the best. According to Hyeong Kya Choi (2018) [16]; Huicheng Liu (2018) [15]; M. Nabipour et al. (2020[17]); Xiongwen Pang et al. (2020[18]), LSTM produces the greatest results when predicting stock prices with the lowest error rate.

One kind of adaptive filter used to solve linear issues is the LMS filter. Finding the filter coefficients and minimizing a system by lowering the error values least mean square are the goals of the filter (Asep Juarna, 2017 [21]; Eleftherios Giovanis, 2018 [22]). They developed a model utilizing deep regression based on CNN and employed a hybrid model for stock value prediction utilizing ML and deep learning techniques. In this case, the validation loss will stabilize as the number of loops increases because CNN was employed as the parameter. They also experimented with predicting stock prices using DL and a hybrid ML model. Data mining and sentiment analysis from online posts or multimedia were employed by Vivek Rajput and Sarika Bobde [23]. Through the use of textual data from social networks, sentiment analysis attempts to extract emotion, whether positive or negative. Using sentiment research to forecast the stock market can lead to more precise and effective outcomes.

III. PROPOSED SYSTEM

As was indicated in the preceding section, obtaining historical market data is a necessary first step. After extracting the feature needed for data analysis, the data must be divided into training and testing sets, the algorithm must be trained forecast prices, and the data must then be visualized. The suggested systems architecture is shown in Fig.1

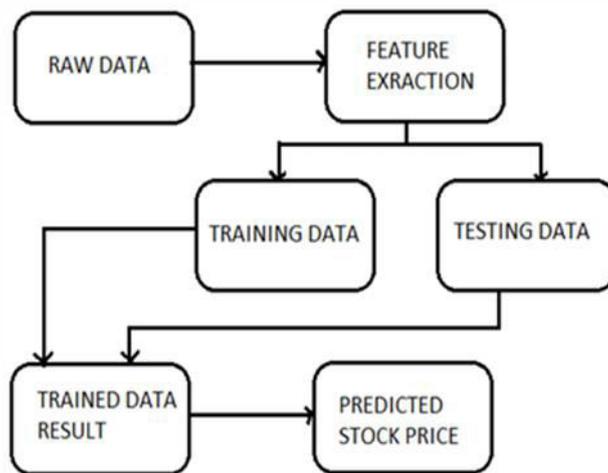


Figure 1: System Architecture

A cell, an information door, an entrance door, and a door with a view comprise as LSTM unit on average. The three inputs control the flow of data into and out of the cell, while the cell gathers values at configurable intervals. The LSTMs capacity to learn context-specific temporal dependency is its primary benefits. As suggested by the name, each LSTM unit gathers data for a variable amount of time without specifically utilizing the activating role in the recurring elements. One important fact to keep in mind is that the output of the disregarded entrance, which varies between 0 and 1, uniquely increases any cell state. Stated differently, the LSTM cells overhead door is in charge of both the loads and the ability to start the cell state. Consequently, instead of growing or contracting exponentially at each time-step or layer, data from a previous cell state can flow through a cell unchanged, and loads can reach their optimal quality in a reasonable amount of time. This makes it possible for LSTMs to handle the evaporating slope problem because the value stored in the memory cell is not changed iteratively. When back-engineering is used, inclination does not go away; for the purposes of our analyses, Indian trading firms include the NSE and BSE.

IV. METHODOLOGIES

A Stock Price Predictor Using LSTM: The suggested framework uses long short-term memory to let it learn online and predict the stocks closing costs. The Extended Short Duration Deep Learning uses a fake intermittent neural network (RNN) design called Long Short-Term Memory [1]. A feed forward neural system without input association,



like photographs, but also complete information groupings, like speeches or videos. For instance, LSTM is useful for tasks like speech recognition, unpartitioned, associated handwriting recognition, and the identification of irregularities in organized traffic or IDS (Interruption Location Frameworks).

Algorithm: LSTM-based stock prediction

Input: Historical stock data

Output: Stock price forecast based on price fluctuation

- Step
- 1: Get going.
 - Step 2: Data Preprocessing follows the acquisition of historical market data for a certain share.
 - Step 3: Read the open price after importing the dataset into the data structure.
 - Step 4: Apply feature scaling to the data to make the values of the data fall between 0 and 1.
 - Step 5; Building a data structure with one output and sixty timestamps.
 - Step 6: Using the data set from Step 5, construct the recurrent neural network (RNN) and initialize it using a sequential repressor.
 - Step 7: To eliminate undesirable values, abb the first LSTM layer and some dropout regularization.
 - Step 8: The output layer is added.
 - Step 9: Adding Adam optimization add the loss as mean squared error to the RNN compilation.
 - Step 10: Forecasting and illustrating the outcomes with the use of charting methods.

V. EXPERIMENTAL RESULTS

The use of Python to implement the suggested LSTM model, which forecasts Google and Reliance share price based on past data. The visualization of the Google and Reliance prediction is displayed in the image below. The expected price of a Google and Reliance share is displayed on the graph below, which is the result of our algorithm, which we implemented and published in our paper. The algorithm predicts the stock price of a share for a specified length of time. The graph below illustrates the conclusion of our method plotted using 96 LSTM units to achieve the desired precision.

Google: In the results, as we have shown in Fig 5.1.1, the graph shows Trade close value for the google dataset. In this graph blue line indicates the training data and the yellow color shown is the predicated values from the test data. Table 5.1.2 shows the accuracy, MSE and RMSE values for no of iterations (epochs).

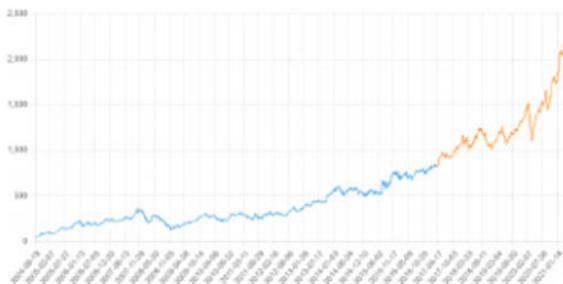


Fig 5.1.1 Google Graph

Table 5.1.2 Google Epochs

epochs	Accuracy	MSE	RMSE
10	93.00717	207.6578	14.41034
20	94.01166	156.3873	12.50549
30	95.64188	105.3248	10.26279
40	95.59026	99.17409	9.958619
50	96.99466	62.24641	7.88964

Reliance: Above graph 5.2.1 shows Trade close value for the Reliance dataset and table 5.2.2 shows the MSE, RMSE and accuracy values for the Reliance dataset.

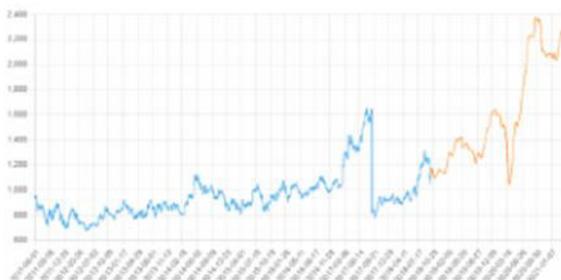


Fig 5.2.1 Reliance Graph

Table 5.2.2 Reliance Epochs

epochs	Accuracy	MSE	RMSE
10	96.25328	4839.5690	69.56701
20	97.63884	2653.1278	51.50852
30	98.19937	1650.3337	40.62430
40	98.13571	1616.9295	40.21106
50	98.37254	1361.8098	36.90270

VI. CONCLUSION

This research conducts a share study that can potentially be expanded to include several shares in the future. A more accurate prediction could be made if the model trains a more layers, LSTM modules, and higher computational capacities to handle a larger amount of data sets. Future improvements will include sentiment analysis from social media to learn what the market believes about price variations for specific shares. This can be implemented by adding Facebook’s API and Twitter to our program, as Facebook is a popular social media platform with a wealth of user posted market trend information.

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