

# Stock Market Price Prediction using Deep Learning Based Approach

# Payel Bose<sup>1</sup> and Samir Kumar Bandyopadhyay<sup>2\*</sup>

<sup>1</sup>Research Associate, GLA University, Mathura, India
<sup>2</sup>Distinguish Professor, GLA University, Mathura, India
\*Corresponding Author: Samir Kumar Bandyopadhyay, Distinguish Professor, GLA University, Mathura, India.
Received: April 11, 2025; Published: May 19, 2025

### Abstract

Stock market price prediction is an inspiring problem domain of financial sector as it involves several factors and drives people towards a complex problem solving approach. Financial markets are one of the key points of any country economy. The price prediction of stock market is analyzed here by Deep leaning approach.

Keywords: Stock Market; Deep Learning; Real Gross Domestic Product and Long Short-Term Memory recurrent neural network

# Introduction

Researchers have been working over several years on stock market prediction which is an interesting problem in itself since a number of variables are involved for prediction. As a part of economic progress, stock market has been the most popular field in the domain of financing. The stock market provides platform to the entrepreneurs and governments so that resources can be mobilized by the investors. Stock Market is the most appropriate investment for the common man as their investments are diversified across multiple entities, provides a platform to gain in professionally managed portfolio at comparatively low cost investment. The stock market is highly perturbed by Real Gross Domestic Product (RGDP), Inflation Rate (INF) and Interest Rate (INT) [1]. The capital market prediction has drawn enormous attention from last few years. This field is quite interesting due to its dynamic, non-linear, complicated, time-varying, and chaotic nature and often affected by economic, political factors [2].

Many investors aim to achieve forecasting technique that could ensure stress-free gaining and eliminate risks from the stock market which drives researches to develop new predictive models [3]. In order to address some real life problems in stock market such as seasonal trend and flow are considered as the emphasis of stock market investors in [4]. By analysing stock market behaviour through techniques and various methods, forecasting tool is necessary to obtain. This tool will assist investors to buy and sell with comfortable price. Prior indication to volatility estimation may aware investors for taking risks. In recent years, several researches have been made for forecasting stock market price. Analysing and forecasting stock market price can be implemented by applying machine learning and other relevant algorithms. The stock market prediction can be short term or long term. However, short term prediction is challenging to obtain than long term prediction. Many Governments in the globe participate in stock market by investing a part of their healthcare, employment, or retirement funds for achieving healthier returns for everyone. Online trading services revolutionised the way people buy and sell stocks. The financial markets have progressed rapidly into an interconnected global marketplace.

This approach paper attempts to predict Tesla stock market price using Deep Learning model. Close price, high price, low price, and open price are forecasted using this proposed model. Experimental results exhibited an accuracy of 86.67%, 86.48%, 89.82%, 88.81% respectively for close, open, high and low prices respectively.

**Citation:** Samir Kumar Bandyopadhyay., et al. "Stock Market Price Prediction using Deep Learning Based Approach". Medicon Engineering Themes 8.5 (2025): 39-42.

#### **Related Works**

Kamijo and Tanigawa in [5] established a pattern recognition technique that estimates the stock prices on the Tokyo Stock Exchange. A comparative analysis between two very promising artificial neural network models between a Long Short-Term Memory recurrent neural network (LSTM-RNN) and a deep neural network (DNN) are drawn in this paper.. This will yield forecast results for daily and weekly activities of the Indian BSE Sensex index. The problem of over-fitting is handled in both the cases. Only closing price data are considered for these models.

40

Cheng-Ming Lee et al. in [6] provide an innovative idea embeds lifting scheme with a neural network model to increase short-term forecasting accuracy. The lifting scheme is a four-stage procedure that splits the original data loads into several sub loads at different resolution levels. These sub loads are fitted using several existing models and the forecasting results are obtained. Applying inverse lifting scheme, original forecasting result is retrieved. Experimental results indicate that the proposed model outperforms well over back-propagation network (BPN) algorithm and traditional models in terms of forecasting accuracy.

Bhuriya et al. in [7] provides a mechanism to estimate Tata Consultancy Services stock price using variants of regression models incorporating five features i.e., open, high, low, close price, and volume. Collected data are divided into two parts- one for defining the model and the other one for testing the model. This training and testing data has the division ratio as 8:2. The paper has drawn a comparative analysis among the performances of the linear, polynomial, and Radial Basis Function (RBF) regression models based on the confidence values of the predicted results. Experimental results convey that the linear regression model outperformed the other techniques.

Instead of using regression models or smoothing models for stock market price prediction from 1980 onwards use of Artificial Intelligence is used in an enormous scale [8]. This section provides idea regarding several researches made using artificial intelligence based techniques.

Concept of textual financial news into the prediction model is used in [8]. The model counts keyword tuples and transforms tuple counts into weights employing couple of learning techniques such as rule-based, nearest neighbor and neural net for forecasting purposes. Experimental results have shown that Rule based techniques obtains potential results. In brief, this application behaves like a decision support tool for portfolio managers for their investments. However, incorporating other interfering factors such as acquiring more information from web, assimilating other conventional time series forecasting tools with this prediction model may achieve higher accuracy.

Kamijo and Tanigawa in [8] establish a pattern recognition technique that is used to estimate the stock prices on the Tokyo Stock Exchange. Recurrent neural networks are utilized to recognize stock price based triangle patterns. This method is also applied for extracting temporal contextual transition. The objective of this paper is to minimize patterns that mismatch.

#### **Proposed Deep Learning Model**

The proposed model is based on Deep Learning Neural Network concept considering the following steps:

#### Step 1: Collection of Raw Data

In this stage, we obtain the data using web-driver from TSLA Inc. and this data is used for the prediction of future stock price.

#### Step 2: Data Pre-processing

#### The pre-processing stage involves

Data reduction: Part of the data is reduced but with particular importance.

Data Division: Splitting the data into training and test data respectively.

Data Integration: The integration of the data files.

After this Stage we proceed to the construction of our prediction model.

#### Step 3: Feature Extraction

In this stage, we choose input parameters are to be fed to the Deep Neural Network model. Since, we will predict the close stock price of 2020 hence we will take the Closed, Opening, High, Low prices as our parameter.

41

#### Step 4: Training the model

In this Stage, the data is fed to the neural network and trained for making predictions. Our model has a sequential input layer and a dense layer.

### Step 5: Output Generation

The obtained output is evaluated on the basis of RMSE [9], MSE [9] and Accuracy [9]. If the MSE and RMSE obtained a small value then we can consider our model to be a perfect one.

### (RMSE-Root Mean Square Error, MSE- Mean Square Error)

The proposed model is implemented by stacking two layers of Neural and two dense layers into single platform. The Neural layers consist of having 50 nodes and the next two dense layers contain 25 and 1 node respectively. This implemented model is trained through 10 epochs with a batch size of 64. The structure of the proposed model is shown in fig. 1. Table 1 and Table 2 show the performance analysis.

Layer (type)	Output Shape	Param #
lstm_1 (LSTM)	(None, 60, 50)	10400
lstm_2 (LSTM)	(None, 50)	20200
dense_1 (Dense)	(None, 25)	1275
dense 2 (Dense)	(None, 1)	26

Figure 1: Structure of Proposed two-layer Model.

Parameters	RMSE	MSE	Accuracy
Close Price	3.12401774	9.75948686	86.67 %
Open Price	4.12401665	17.0075133295	86.48 %
High Price	2.12457332	4.51381179206	89.82 %
Low Price	2.12457332	4.51381179206	88.81 %

Table 1: Performance summary of proposed two-layer model.

Predicted Items	Original value	Predicted value
Close Price	390.51124	384.44336
Open Price	370.78835	362.54331
High Price	360.67885	357. 57994
Low Price	380.77882	384.67332

42

Table 2: Comparison of Predictive Prices with Original prices.

# Conclusions

The popularity of the stock market trading is growing rapidly, and thus day by day it is increasing researchers to develop new techniques to make more accurate predictions. This is not only helping researchers but also helps investors or any other person dealing with the stock market. Governments of most countries invest a part of their health care, employment or retirement funds into stock market to achieve better returns for anyone. The financial markets have evolved rapidly into a strong and interconnected global marketplace. These advancements bring forth new opportunities and the data science techniques offer many advantages but along with that they also carry various set of challenges. In order to predict the stock indices, a forecasting model with good accuracy is required to improve the stock market scenario and to tackle the challenges related to it.

### References

- S Yadav. "Stock Market Volatility A Study of Indian Stock Market Original Research Paper Management Stock Market Volatility A Study of Indian Stock Market". Glob. J. Res. Anal 6.4 (2017): 629-632.
- 2. TZ Tan, C Quek and GS Ng. "Biological brain-inspired genetic complementary learning for stock market and bank failure prediction". Comput. Intell 23.2 (2007): 236-261.
- 3. GS Atsalakis, EM Dimitrakakis and CD Zopounidis. "Elliott Wave Theory and neuro-fuzzy systems, in stock market prediction: The WASP system". Expert Syst. Appl 38.8 (2011): 9196-9206.
- 4. UD B, SD and AP. "An Effective Time Series Analysis for Stock Trend Prediction Using ARIMA Model for Nifty Midcap-50". Int. J. Data Min. Knowl. Manag. Process 3.1 (2013): 65-78.
- 5. AA Adebiyi, AO Adewumi and CK Ayo. "Stock price prediction using the ARIMA model". Proc. UKSim-AMSS 16th Int. Conf. Comput. Model. Simulation, UKSim 2014 (2014): 106-112.
- CM Lee and CN Ko. "Short-term load forecasting using lifting scheme and ARIMA models". Expert Syst. Appl 38.5 (2011): 5902-5911.
- 7. D Bhuriya., et al. "Stock Market Predication Using a Linear Regression". (2017): 510-513.
- 8. Kichi Kamijo and T Tanigawa. "Stock price pattern recognition--A recurrent neural network approach". (1990): 215-221.
- 9. H M and S MN. "A Review on Evaluation Metrics for Data Classification Evaluations". Int. J. Data Min. Knowl. Manag. Process 5.2 (2015): 01-11.

# Volume 8 Issue 5 May 2025 © All rights are reserved by Samir Kumar Bandyopadhyay., et al.