# SURVEY ON STOCK MARKET PRICE PREDICTION VIA DEEP NEURAL NETWORKS

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***Abstract*** · Many scholars and analysts find the art of stock price prevision a difficult task. Yes, investors are very interested in stock price forecasting studies. Many investors want to know the future situation of the stock market for good and profitable investment. Good and effective prediction systems for stock market help traders, investors, and analyst by providing supportive information like the future direction of the stock market. We present a recurrent neural network (RNN) and Long Short-Term Memory (LSTM) approach in this research to forecast indices on the stock markets.

***Keywords*: Deep learning approach; Long Short-Term Memory (LSTM) Neural Network; Sentiment Analysis;**

## I. INTRODUCTION

In today's complex, daunting, flexible, expanding, demanding prediction scenario, stock-market data plays a very crucial role.

How can useful information be derived from recent trading data to predict ups and downs at the next moment when financial time series such as S&P 500 or historical data in stock markets are available? Recent work on this issue shows initial evidence that machine learning techniques can recognise the nonlinear relationship in patterns in stock price.

Time series is a list of the value of a given asset on the financial stock market. Investment is especially important in forecasting financial time series trends. Compared with other time series, the financial time series has certain particular characteristics due to the financial sector microstructure. One fundamental aspect is the high frequency of individual values, contributing to the dynamics of those time series intensifying the effect of non-systematic influences.

It shows a high degree of volatility and not stationary financial time series. The role of forecasting financial time series has been proven challenging due to its inherent uncertainty, where conventional statistical models of machine learning methods and artificial neural networks(ANN) have been widely investigated. Most of the existing models are very focused on accurate future price prediction. Nonetheless, some work is being carried out on the estimation of the price path, i.e. the upward and downward trends in the time series. Future pattern forecast focuses more on.

There are many complicated financial indicators as well as extremely aggressive stock-market fluctuations. However, as technology progresses, there is a growing opportunity to gain a steady fortune from the stock market and it also helps experts find the most insightful metrics to make better predictions.. The market value forecast is very critical if the benefit of purchasing stock options is to be maximized and low risk is retained. One of the most popular models for sequential data processing has been repetitive neural networks (RNNs). Long-term memory is one of RNN's most common architectures, A calculating device that replaces the secret layer of the network by the conventional artificial neurons. Networks can effectively connect memories and remote input in time with these memory cells, making it ideal to capture the data structure dynamically over time with high predictive power. The paper we presented and estimated S and P 500's inventory returns by using LSTM. For the training and validation of the model we gathered 5 years of S and P 500 historical data and used them.

In Section 2, we shall give a brief review of the related works, some of them will compare with our system followed by section 3, in which we will propose the algorithm used to forecast stock prices.

In section 4 we had the findings and comparison where we had used different methods to forecast the prices and we will see the Neural Networks outperforming all the other algorithms there. In section 5, the results are concluded based on the algorithm's efficiency. Section 5 includes all of the paper references that we examined carefully.

## II. RELATED WORKS

We proposed a new way to rebuild the financial series in the meantime: most previous methods focus on the frequency degrading of time serial signals or the reconstruction of phase space such as wave[ 1] decay and analytical models. However, this type of processing method has been affected by local data characteristics and a lack of consideration of dependencies between time segments resulting in inaccurate prediction model results. We simplify repetitive and noisy-filled financial temporal information by leveraging motive information in the financial series to reduce this effect.

We present a new trend prediction scheme on financial time series: Unlike the existing sequence prediction models, using CNN in conjunction with two fully connected layers to capture the spatial associations between historical and current patterns and achieve performance improvement.
.According to William J Frawley, Gregory Piatetsky-Shapiro, and Christopher J Matheus: "Knowledge discovery in databases, also known as Data mining, is the non-trivial process of identifying valid, novel, potentially useful, and ultimately understandable patterns in data."

Priti Saxena presented the paper which proposes a new approach of analysing the stock market and predicting in a hybrid form of linguistic-a prior concept **[2]**. It provides accurate results in stock prediction which has a great impact in decision making with respect to the clients and knowledge discovery of various useful patterns for brokers. This approach provides the clients with the ease of getting information status of any stock price movement immediately.

In real life applications, the numbers of frequent sets are large in number and as the result; the numbers of association rules are also very large. We select only the rules in which we are interested for stock price prediction in this context.

There are many data mining algorithms such as A prior Algorithm **[2]**, Partition algorithm, Pincer-Search Algorithm, Dynamic Item set Counting Algorithm, FP-Tree Growth etc are used for finding the discovery of frequent sets are related with association rules. The paper has applied A prior algorithm to the dataset to find the frequent sets and with the help of the algorithm we are predicting the stock price variation for multiple companies for multiple number of days.

This paper tells us the use of Data analytics in the field of financial predictions such as Stock Price prediction by using platforms such as Python and R with the assistance of techniques like Neural networks, linear regression and time series analysis and also including the use of sentiment analysis which helps in prediction by also taking data points from social media such as Twitter. they applied mathematical models algorithms like Autoregressive Integrated Moving Average model (ARIMA)**[3]**, Polynomial model, and Linear Regression method, Time Series Model and Radial Basis Function Neural Network and Multi-Layer Perceptron Neural Network, of the Artificial Neural Network (ANN) models and compared the results and found the most accurate and efficient model.

They finally concluded that if more number of nodes are used then the results are more accurate and have better predictions.

In this developing country which relies on the stock market for economic growth. Precise projections of future trends are very important for the model. The model should have a reliable stock value forecast, as it has a high impact on a country's economy. For a prediction model exhibiting non- linear signal it requires advanced algorithms of machine learning such as ANN(Artificial neural network) **[4]** with different feature selection. In this paper the study will show that the classification algorithm SVM(support vector machine) with different feature selection will have accuracy in the outcome.

Today, stock market forecasting is the most important issue. Investors are finding opportunities to invest in the stock market in order to increase their earnings and reduce investment risk. In stock price forecasting, machine learning also plays a very important role and is the most reliable method compared to traditional approaches such as basic and technological analysis. To predict the future market price, machine learning uses different algorithms. In this paper , mostly used regression analysis is used to predict the stock price based on stock market data .**[5]**

For advanced countries such as India's economic growth, stocks play a very important role. When the share price is low, economic growth will decline and economic growth will increase as the stock market increases. Therefore, the stock market is directly proportional to the economic growth of a country. The forecasting of stocks therefore plays a vital role in the economic development of a country which is accomplished through machine learning. It is more necessary to obtain positive predictive results for investors. Tools for data mining that predict future actions and patterns will accomplish this. These intelligent data analysis tools create a database that may lack secret data. There is an enormous amount of data generated by secret stock markets which data mining can achieve. Data mining therefore plays an important role in finding and uncovering hidden patterns which enhance the accuracy of the model.

Bond predictions are the most challenging and social media have a major impact on the perception of future changes in the market. In the prediction model similar algorithms are used to forecast stock advertising prices. The model is to predict monthly or daily stock price. The program performs a comparative study of such algorithms as multiple linear regression, Help Vector Machine & Artificial Network predict the next day's available market price. Then sentimental analysis which extracts feelings out of the social media is used for best forecasting[6 ].

Because of its high profits, the stock market is the most common investing platform. When investors adopt strategies that increase profit and reduce investment risk. The model does

comparative study of stock predicting algorithms and determine the best predicting algorithm.

Recording to the model with more than two predictive variables, the multiple linear regression model is the solution used, since the model has more than two predictive variables, calculating the least square value to minimize the error of predictive results.. Artificial neural network a deep learning approach for hidden data neurons is used to forecast the price which contains input layer, hidden layer and output layers , Where output layer for summation value calculates a sigmoid function. Finally the nostalgic [ 6 ] analysis and the latest predictive algorithm are combined to optimize the outcomes.

The main objective of the stock market forecast is to estimate a product's future financial stock price. The stock price forecasting uses machine learning technology which predicts the next day's market open value by checking with the previous data for easier and accurate estimation on various machine learning algorithms. This paper focuses mainly on regression and LSTM-based machine prediction.

Great market forecasts would bring huge profits and also high the anxiety of shareholders. The stock price can be predicted when we research the stock market history. It forecasts a market value close to a tangible value that increases accuracy. The data set used in the project is the most important part of the computer analysis. You can use Yahoo Finance to navigate the dataset. The process involves regression and LSTM models[7] separately. Return requires error reduction and LSTM leads to long-term data and test memory. In the end, the graphs are drawn based on the dating price (from regression) and between the actual and predicted price (from LSTM).

## III. RESULT COMPARISON

| Algorithm | MAE | RMSE | R squared |
|---|---|---|---|
| **Decision Tree Regression** | 19.215 | 27.177 | 0.9565 |
| **Bagging Regression** | 17.596 | 24.100 | 0.9658 |
| **Random forest** | 19.375 | 28.637 | 0.9517 |

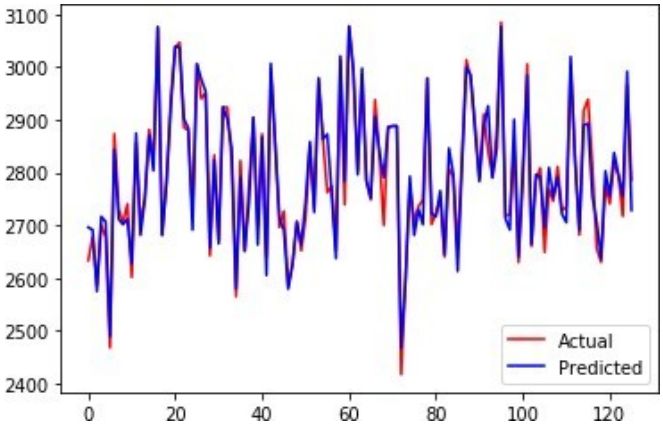

Figure - 1 : Decision Tree Regression Results

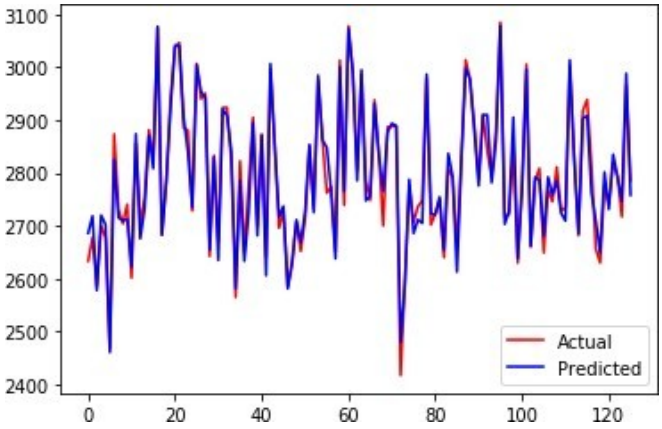

Figure - 2 : Bagging Regression Results

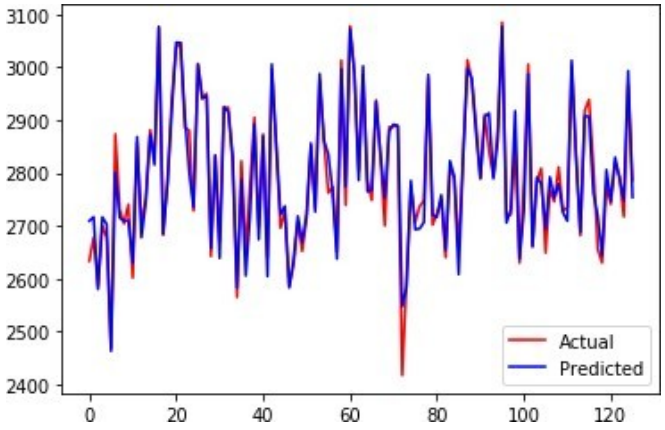

Figure - 3 : Random Forest Results

## IV. CONCLUSION

More techniques to compare the performance of stock price prediction will be investigated for future study. The number of lookbacks will be further investigated. The critical impact factor that can affect the fundamental of stock price analysis will be investigated, in addition, if it shows any relationship with the forecasting performance, the market condition will be investigated.

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