



IJIRCCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 12, Issue 3, March 2024

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.379

 9940 572 462

 6381 907 438

 ijircce@gmail.com

 www.ijircce.com

Stock Price Prediction using Machine Learning Techniques

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ABSTRACT: In this study, we evaluate the performance of three prominent algorithms for stock price prediction: Long Short-Term Memory (LSTM), Linear Regression, and Autoregressive Integrated Moving Average (ARIMA). LSTM is renowned for its adeptness in capturing long-term dependencies in sequential data, making it a favored choice for stock price prediction tasks. Linear Regression, despite its simplicity, demonstrates effectiveness by establishing a linear relationship between input features and the target variable, thus offering a straightforward approach to stock price forecasting. ARIMA, a classical statistical method, models temporal dependencies and trends within time series data, presenting a robust alternative for predictive modeling. Our experimental findings reveal that LSTM consistently surpasses ARIMA and Linear Regression in predictive accuracy across stock price prediction tasks. Nevertheless, the selection of the most suitable algorithm may hinge on various factors, including data availability, computational resources, and the distinctive characteristics of the targeted stock market. In conclusion, this study contributes valuable insights into the comparative effectiveness of LSTM, Linear Regression, and ARIMA for stock price prediction. These findings offer practical guidance to practitioners and researchers for selecting optimal models tailored to their specific forecasting requirements. Furthermore, the accompanying graph provides a visual representation of predicted stock prices for the upcoming week, underscoring the practical utility of these predictive models in real-world investment decision-making.

KEYWORDS: Company Name, Open, Close, Adjacent Close, High, Low, Date, ARIMA, LSTM (Long Short Term Memory Cell) Linear Regression.

I. INTRODUCTION

The stock market is the complex and dynamic system that has the potential to offer high returns on investments but also poses a significant risk to investors. Predicting stock prices and trends has always been a challenge for financial analysts and investors, and traditional approaches based on technical and fundamental analysis have limitations in accurately forecasting the future of the market according to the news given[3].

Recent advances in the machine learning and artificial intelligence[15] have provided new opportunities to analyze and predict stock market trends. Machine learning algorithms can analyze vast amounts of the historical data and identify patterns and trends that may not be visible to human analysts. By utilizing these patterns, machine learning models can make predictions about future stock prices and market trends with greater accuracy. There are three different types of techniques of machine learning like ARIMA, Linear Regression and Deep Learning techniques like LSTM[16].

The Linear Regression is one of the easy way which is used for the Sequence Order in dataset[8]. These Machine Learning model is widely used for the data prediction propose. The ARIMA model which is also a machine learning technique is used for the auto regression propose and find the past values and predict the future values accordingly for the user propose[8]. These ARIMA model is quiet important and also mostly used for the Integration and moving average which uses the past data for forecasting the data in the dataset[9].

In this context the LSTM plays a major role in the prediction propose, the Long Short Term Memory [LSTM] will remember the past values in the dataset which are used more data from the dataset and predict the future which are used for the investorto gain the profits by using the Deep learning[16].

In this context, by the applying the machine learning techniques to the stock market, prediction problem has gained considerable attention from researchers and financial experts. The use of these models can help the investors and traders make informed decisions, manage risk, and maximize profits and also minimize the loss of investors. However, the prediction of the stock market is still a complex task that requires careful consideration of various the factors, including market trends, political events, and economic conditions.

In this article, we will explore the current state of Machine Learning based stock market prediction these all using the deeplearning and discuss the challenges and opportunities in this all field. By the end of this article, the reader will have a better idea and the also understanding of the potential on Machine Learning in the field of stock market prediction.

In summary, the company stock price prediction is an innovation to solutions that can help the investors the challenges they face in prediction

This Article, presents a company stock price prediction that utilizes Machine Learning algorithms to provide accurate and personalized recommendations to Investors. This system analyzes data from various sources, that use different types of attributes in the stock market. The system's primary goal is to assist farmers in making informed decisions that increase their productivity and profitability while minimizing risks and costs associated with crop cultivation.

In summary, the company stock price prediction is an innovation to solutions that can help investors the challenges they face in prediction.

II. LITERATURE SURVEY

The Stock Market is a place where all the company or organization are listed for the IPO's (Initial Public Offerings). Here, all the company or organizations will release their company share to public to buy share of their company. There is not only share of a company, but the public can buy the all bonds etc. The Bonds are acts as the assets of the company by the company will get the loans from any banking sector. The Stock Market is so volatility and unpredictable in the world. The Stock Market is also based on other factors which also plays a vital role in the price going ups and downs.

Stock Market Analysis:

Stock market analysis is the process of examining and interpreting data to make informed investment decisions. It involves a range of techniques, including technical analysis, fundamental analysis, and quantitative analysis. Technical analysis involves analyzing charts and patterns to predict future price movements. The process of analyzing the financial statements of a company which determine the intrinsic value. Quantitative analysis involves using statistical and mathematical models to analyze data and identify trends. This analysis will also include the Geopolitics and the US Market and European Market to.

Stock Market Volatility:

The Stock Market is so Volatility which can be more loss to the investors a lot of money in a day. The Market is Volatility is due the Government Decision which brings a lot of difference in the market. The Banking sector comes under this, whenever there is a change in Repo Rate then the Stock Market Becomes More Volatility in a day. By these stock Market is more Volatile.

Stock Market Efficiency:

Stock market efficiency define that the ratio of the which stock price reflects available information. The efficient market hypothesis suggests that stock prices are always fully reflective of all available information, making it impossible to consistently outperform the market. However, there is ongoing debate among economists and investors about the efficiency of the stock market, with some arguing that inefficiencies exist and can be exploited through careful analysis and trading strategies. There are different ways to find the efficiency in the Stock Market according to the company and the News about the company in the market.



Overall, these surveys demonstrate the growing interest and potential of company Stock price prediction using Machine Learning in the financial sector, and highlight the need for further research to overcome the challenges associated with these systems. There are different models are consideration which can predict the company price.

IV. RELATED WORK

In this paper, the dataset has being taken for the predictionpropose the dataset have done the different pre-processing techniques for the data to avoid the data loss, to find the missing values in the data. In the pre-processing, segmentation, feature extraction and classification are just a few of the processes it goes through.

The Date after the pre-processing it goes through the trainand test split module. These is the classification of differ thedata into the train and the test dataset. By giving the trainingto the train dataset can be used to prediction for the test dataset by using the train dataset. By these doing the we can able to find the difference in the train dataset and the test dataset. By using the LSTM model the loss of the price will be done using the epoch which is used for the minimal loss for the investor. The LSTM is an important for the predictionpurpose.

The ARIMA is a Machine Learning technique for the prediction for the stock which will be useful for investors in the stock market. The ARIMA have the auto regression whichwill be used for the prediction by using the past values in thedataset. Integrated will be used for the trend in the past valuesof the dataset.

The Linear Regression is the simple method in the machine learning. Here, the dependent variable will be targeted in the data, the independent variable is used for it. These is the Linear Regression.

The accuracy for the Linear Regression is about 98% andthese accuracy in the dataset. By using the accuracy, the investor will make the decision accordingly. The accuracy forthe ARIMA is the about 84% which is more accurate in the dataset, and then the Linear Regression.

The accuracy for the LSTM which is a deep Learning technique for long short-term memory which is used for long time remembering to propose. The Accuracy is more than any other model which is 72% and the accurate is more.

V. PROPOSED METHODOLOGY

We have used different types of Machine Learning algorithms and Deep Learning to recommend the suitable stock to be invested on the companies the predictionmay be for stock of the company, by the selling and buying may be done in the company. Different evaluation metrics like error rate, accuracy is used to compare the four models.

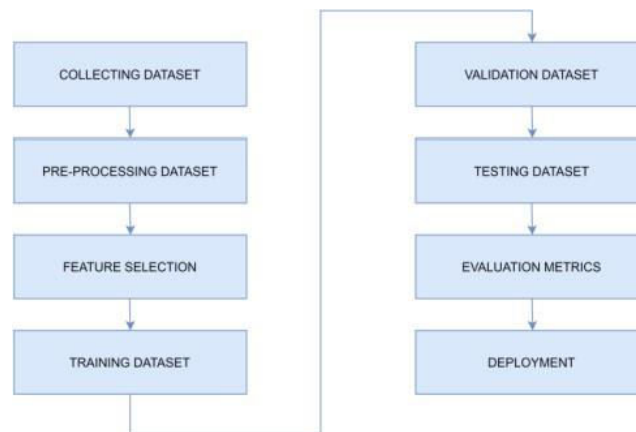


Fig. 1: Proposed system work flow



A. DATASET COLLECTIONS

The Data set is collected from the Kaggle website:<https://www.kaggle.com/datasets/daiearth22/uniqlo-fastretailing-stock-price-prediction?resource=download>

The dataset contains data related to Company. The dataset size is 1010 rows and 6 columns namely Date, Open, Close, Adj Close, Low, High, Volume.

	Date	Open	High	Low	Close	Adj Close	Volu
0	2018-02-05	262.000000	267.899994	250.029999	254.259995	254.259995	11896
1	2018-02-06	247.699997	266.700012	245.000000	265.720001	265.720001	12595
2	2018-02-07	266.579987	272.450012	264.329987	264.559998	264.559998	8981
3	2018-02-08	267.079987	267.619995	250.000000	250.100006	250.100006	9306
4	2018-02-09	253.850006	255.800003	236.110001	249.470001	249.470001	16906

Fig. 2: Dataset diagram

B. Data Cleaning and Feature Extraction

Before giving the data to any machine learning algorithms the data must be cleaned. In data cleaning process null values and outliers are removed. In the collected dataset no null values are present. After dataset cleaning, features are extracted from the data set. In dataset we have 6 different features which affects our model output and we have to check the correlation among the features.

C. Model Architecture

In this step dataset is spitted in 75% and 25% for training and testing. During training, Machine Learning algorithms finds the relation between the input and output features. By using this relation, the model able to predict the Outputs to new input values. In this we used the following four machine learning models:

1 Linear Regression: Linear regression is the simple algorithm and most popular Machine Learning method. The Linear means that the data is done in a Linear or Sequence Order without the complete data the linear regression may be not done. While the Regression means that the technique used to find the relationship between the Dependent Variable and the Independent Variable in the dataset. Both is combined is Linear Regression means that the data is Sequence check the relationship between the independent variable and the dependent variable in the machine learning.

2. ARIMA: ARIMA known as the Auto Regressive Integrated Moving Average. It is most used statistical method for time series forecasting. ARIMA can be used to model a wide range of Time Series Data, including economic data, weather data, and stock prices. The model is composed of three parts:

Auto Regression (AR): This part of the model which uses the past values to predict the future values. It assumes that future values of the time series depend linearly on its past values.

Integrated (I): This model is used for the removal of trend from Time Series to predict the future values. The differencing involved by subtracting the previous observation values from the current observation values.

Moving Average (MA): This model of the moving average uses the errors of previous forecasts for prediction of future values of the Time Series. It assumes that the errors follow a white noise process.

The parameters of an ARIMA model are usually determined using a process called parameter estimation, which involves finding the values of p, d, and q that minimize a selected objective function, models can be quite effective for forecasting, but they have some limitations. For example, they may not be appropriate for non-stationary time series data, and they may not capture more complex patterns in the data. Other time series models, such as SARIMA or VARIMA, may be more appropriate for certain types of data.

3. LSTM: LSTM stands for Long Short-Term Memory, which is a type of neural network, commonly used for



processing linear data, such as time series or natural language. LSTMs were developed to address some of the limitations of traditional Recurrent Neural Networks (RNNs), which can have difficulty learning long-term dependencies in sequential data. LSTMs use a memory cell that allows information to be stored and retrieved over long periods of time.

The memory cell is composed of several gates that controls the flow of information into and out of the cell. The are gates input gate, output gate, and forget gate, which are controlled by sigmoid activation functions. The input gate controls the flow of new information into the cell, the forget gate determines which information is discarded from the cell, and the output gate controls the output of information from the cell.

LSTM networks are trained using Back Propagation through time, which involves computing gradients with respect to the weights at each time step and updating the weights using an optimization algorithm such as stochastic gradient descent.

LSTM have been successfully used in a variety of applications, including speech recognition, language modeling, and time series prediction. They are particularly effective for modeling sequential data with long-term dependencies, where traditional RNNs may struggle. However, they can be computationally expensive and required a large amount of training data to learn effectively.

VI. RESULT AND ANALYSIS

After created all the four models by using the training data ,we test the models by using the test data and calculates the accuracies of the models. The following table shows the accuracies of different models:

Models	Accuracy
Linear Regression	98%
ARIMA	84%
LSTM	72%

Fig.4 Accuracy Table

From the above table we selected LSTM because it gives the highest accuracy.

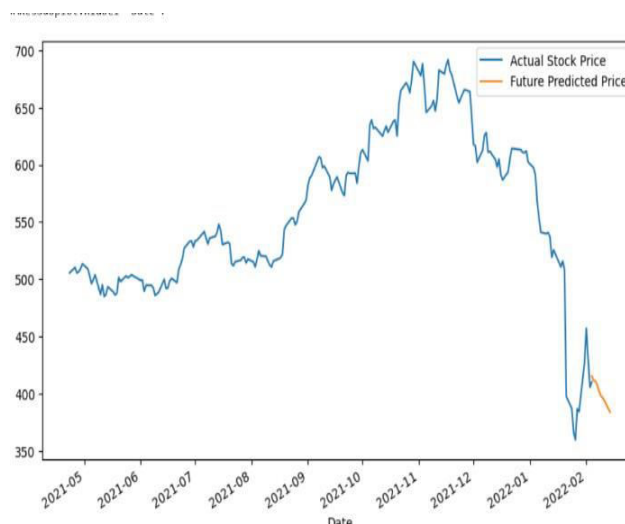


Fig.6(a) ARIMA Prediction

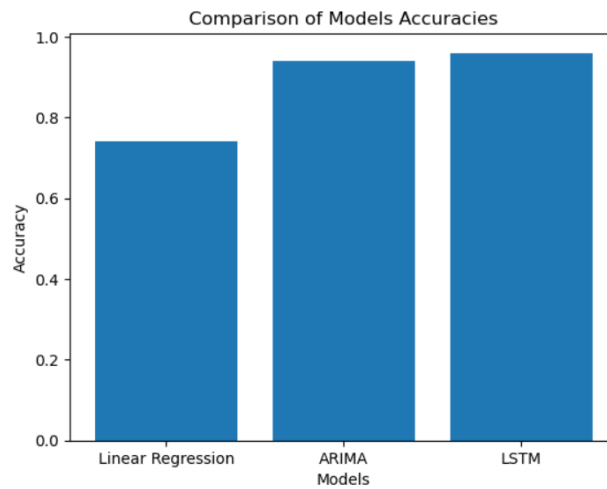


Fig.6(b) Accuracy Comparison

[<matplotlib.lines.Line2D at 0x2387184d9d0>]

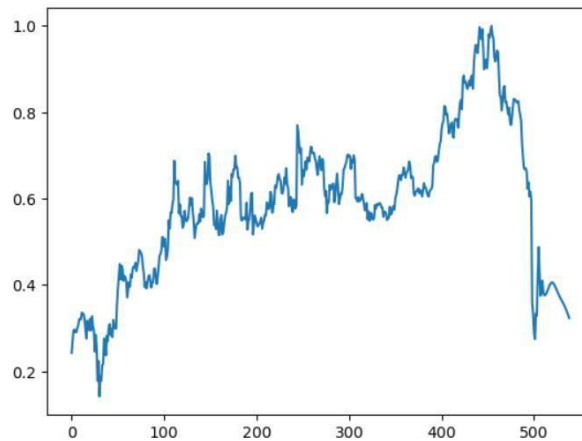


Fig.6(c) LSTM Prediction

VII. CONCLUSION

In conclusion, these company price prediction using machine learning and deep learning is a highly useful tool for all the traders to determine the best profits for the particular company. By utilizing various data inputs such as open type and close, the system can provide recommendations that have been optimized for maximum profit.

This project has highlighted the benefits of machine learning in stock market, and how it can help improve the efficiency and effectiveness of prediction of the stock. By automating these types of different methods can save time while also reducing the risk of making costly mistakes.

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