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Stock Price Prediction Using Machine Learning

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***Abstract*—As the need for precise and fast stock price projections is growing as financial markets continue to become more complicated. The use of Long Short-Term Memory (LSTM) neural networks for stock price forecasting is investigated in this paper. LSTMs are especially important for time series prediction tasks because they are good at capturing temporal dependencies in sequential data. In this study, LSTM models are trained and evaluated using historical stock price data while taking into account a variety of input features and hyperparameters. By contrasting the performance of LSTM models with conventional machine learning techniques, the advantages and disadvantages of each methodology are brought to light. The findings showed that LSTM models offer greater predictive capabilities, highlighting its potential in improving investment decisions and furthermore, the analysis of IBM Company Stock Price Values and model performance configurations add to the expanding body of knowledge about using deep learning approaches for financial forecasting.**

Keywords*—Machine Learning, Neural Networks, RNN, Linear Regression, LSTM, Supervised Learning.

I. INTRODUCTION

In the world of finance, predicting stock prices has always been difficult since traders and investors want to know what the market will do in the future so they can make better decisions. Financial professionals' approach to stock market analysis has undergone a paradigm shift since the introduction of machine learning (ML) tools. Machine learning algorithms provide a data-driven method of predicting stock values by using patterns, characteristics, and previous data to generate forecasts. The stock market is a dynamic, intricate system that is impacted by many different things, such as investor sentiment, company performance, geopolitical developments, and economic data. The large volume of available data contains complex patterns and nonlinear interactions that are difficult for traditional methods of stock research to fully grasp. On the other hand, machine learning algorithms are very good at managing big datasets and seeing intricate patterns that could be difficult for humans to analyze. In order to predict stock prices using machine learning, models are trained on past market data in order to identify trends and connections between different input variables and stock prices. Afterwards, investors may use these models to forecast future stock values, giving them important information for risk management, portfolio management, and strategic decision-making.

Data preprocessing, feature engineering, model selection, and evaluation are important steps in machine learning-based stock price prediction. Machine learning models frequently incorporate historical stock prices, trade volumes, technical indicators, and macroeconomic data as input features. The intricacy of the issue and the properties of the data determine whether model—linear regression, decision trees, support vector machines, or more sophisticated deep learning architectures—should be used. Even though machine learning has demonstrated potential for stock price prediction, it's critical to recognize the dangers and uncertainties that come with working in the financial markets. Unexpected occurrences have the potential to impact market dynamics, and past performance does not guarantee future outcomes. As a result, careful feature engineering, ongoing model improvement to accommodate shifting market conditions, and a thorough grasp of financial markets are all necessary when applying machine learning to stock price prediction.

Machine learning and finance are combining to change the way we study and predict moves in the stock market as data becomes more accessible and technology advances. Tick price analysis is one of the most important uses of machine learning and has been a crucial area of research. You will learn how to use machine learning and deep learning techniques to predict stock prices in this video. Here, you will train your model on Google stock data using an LSTM network. A stock market is an open marketplace where shares of companies that are publicly traded can be purchased and sold. The ownership of the corporation is represented by the stocks, commonly referred to as equities. The intermediary

that permits the purchase and sale of shares is the stock exchange. Recurrent neural networks, or LTSMs, are one kind of network used to learn long-term dependencies. Time-series data processing and prediction are two common uses for it. As you can see from the graphic at the top, LSTMs are structured like chains. There is only one neural network layer in general RNNs. In contrast, LSTMs feature four interacting layers that communicate incredibly well. Every working day, the value of MSFT's stocks is updated on the NASDAQ, where they are listed. Please take note that trading is not permitted on Saturdays or Sundays on this There is a space between the two dates as a result. For every date, the stock's Opening Value, its Highest and Lowest values on that particular day, and its Closing Value at the end of the trading day are all displayed.

II. LITERATURE REVIEW

The Authors' Appropriate Approach discusses a way for calculating a company's net growth and using LSTM models to evaluate and forecast a company's future performance in the stock market. This approach creates a prediction system for evaluating and estimating a company's future development in the stock market by integrating data analysis, machine learning, LSTM models, and a net growth computation, Amrata Shet,et.al[1].

Regression and LSTM (Long Short-Term Memory) models are two machine learning techniques that are used in this situation to predict the stock market.This task entails testing out different machine learning algorithms, choosing pertinent features, and evaluating how well they predict stock values. The goal of the research is to determine the best method for correctly predicting stock market trends, especially in situations where money is tight, Abhinav Gangwar,et.al[2].

The paper's methodology centers on the use of machine learning, particularly LSTM (Long Short-Term Memory) and Regression models, to the prediction of stock prices. The comparison and application of LSTM and regression models for stock value prediction appears to be the main focus of the paper. It highlights the need to choose an algorithm that takes into account parameters such as opening and closing times, stock low and high values, and trading volume when selecting an algorithm that optimizes accuracy, response time, and segmentation efficacy, B. N. Varaprasad,et.al[3].

Authors Focus on challenges the idea that stock market movements are completely unpredictable and instead aims to leverage machine learning techniques to identify patterns and trends that can help forecast future stock prices more accurately, enabling more profitable and risk-averse investment strategies. The focus is on using machine learning to predict stock prices more profitably while reducing risk Anshuman Behera,et.al.[4].

The description's methodology centers on the use of Long Short-Term Memory (LSTM) networks for stock price prediction. In comparison to more conventional approaches, this study's approach, which uses LSTM networks to forecast future stock values, shows how accurate predictions may be made. The intention is to give investors and financial experts insightful information so they can make better decisions when it comes to trading and investing in the stock market Patel Vraj Hemangkumar,et.al[5].

The goal of the study is to improve the accuracy of stock price predictions by utilizing machine learning, more especially Long Short-Term Memory (LSTM) approaches. Machine learning techniques are used to forecast stock prices with the goal of increasing accuracy by taking into account external factors and a variety of mathematical functions in addition to historical stock price data Amodh Kumar,et.al[6] The goal of the strategy is to make stock market data less complicated and more predictable so that investors—especially those who are new to the market—can make better judgments.

The prevalent application of algorithmic trading, the growing significance of machine learning in quantitative finance, the effectiveness of machine learning models in asset price prediction, and the distinction between algorithmic trading and human decision-making in the financial markets are all seemingly covered in this paper Aashay Chaudhari[7].

The goal of this research project is to anticipate NIFTY 50 index values by means of a hybrid strategy that combines machine learning and deep learning techniques, with a particular emphasis on regression models and LSTM networks. The results demonstrated how well the LSTM-based univariate model performed in forecasting future index values using previous data, Sidra Mehtab,et.al[8].

Through the use of a hybrid modeling approach that combines machine learning and deep learning techniques, this research aims to predict stock prices, with a particular focus on Reliance Industries Limited. Additionally, the research focuses on predicting the closing value of Reliance Industries Limited stock. The results show that, out of all the models evaluated for predicting RIL stock prices, the LSTM-based univariate model with one-week historical data has the highest accuracy Manav Hirey,et.al[9].

Authors describes a study that focused on applying different machine learning techniques, especially regression models, to accurately predict stock market returns. The research focuses on using these techniques to accurately predict stock market returns. The objective is to forecast stock prices with a high degree of accuracy and precision, giving investors and financial institutions important information Shreya Pawaskar[10].

An attempt to apply a machine learning technique for stock price prediction is described in the abstract. The research involves the practical application of machine learning techniques, specifically LSTM and CNN, for stock price prediction. The main goal of the research is to use machine

learning to forecast stock prices in an efficient manner, enabling more informed and accurate financial decisions. The main goal is to develop a model that forecasts the direction of stock price movement and incorporates machine learning, mathematical operations, and outside variables for improved forecast accuracy, Gandhe Sainath,et.al[11].

III. METHEDOLOGY

1. **Data Preprocessing and Collection:** Compiling historical stock market data is essential. Open, high, low, close, volume, and other pertinent financial indicators may be included in this data. Preprocessing includes feature engineering, normalization, data cleansing, and management of missing variables.
2. **Feature Engineering and Selection**: It's critical to determine which features are most pertinent and have the most potential to influence stock prices. To enhance model performance, feature engineering may entail the creation of new variables, the transformation of current ones, or the selection of feature subsets.
3. **Model Selection**: Selecting the right machine learning algorithms is essential for predicting stock prices. It is possible to think about more complicated models like Decision Trees, Random Forests, Support Vector Machines (SVM), or Neural Networks like CNN or LSTM, or regression-based models like Linear Regression and Polynomial Regression.
4. **Training and Validation**: To train a model, the dataset must be divided into training and validation sets. The predictive power of the model is determined by evaluating its performance on a different validation set after it has been trained on historical data.
5. **Hyperparameter tuning**: Improving the model's performance involves fine-tuning its hyperparameters. The optimal combination of hyperparameters can be found using strategies such as grid search or random search.
6. **Evaluation Metrics**: Choosing the right evaluation metrics is essential to determining how well the model performs. R-squared (R2), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and Mean Absolute Error (MAE) are common metrics for regression models.
7. **Evaluation of Performance and Backtesting**: In order to assess the model's effectiveness in real-world situations, it is essential to conduct a backtest on historical data following training. This stage aids in determining whether the model is reliable enough to produce accurate forecasts under various market circumstances.
8. **Implementation and Deployment**: After a model is developed to a high degree of satisfaction, real-time predictions can be made using it. In order to adjust to shifting market conditions and increase model accuracy over time, it may be required to do ongoing monitoring and retraining.
9. **Metrics for evaluation and support roles:** Our current model evaluation measures will be the Root Mean Squared Error (RMSE) and the Mean Absolute Percentage Error (MAPE), since stock price prediction is really a regression problem. Both are practical indicators of forecast precision.

$$RMSE = \sqrt{\frac{1}{N} * \sum_{t=1}^{N} (At - Ft)^2}$$

$$MAPE = \frac{1}{N} * \sum_{t=1}^{N} \left| \frac{At - Ft}{At} \right|$$

where At denotes the actual or true stock price, Ft is the expected or forecast value, and N is the number of time points and Whereas MAPE (%) gauges this disparity in relation to the true values, RMSE provides the disparities between the predicted and true values. A mean difference of 12%, for instance, is shown by a MAPE value of 12% between the expected and actual stock prices.

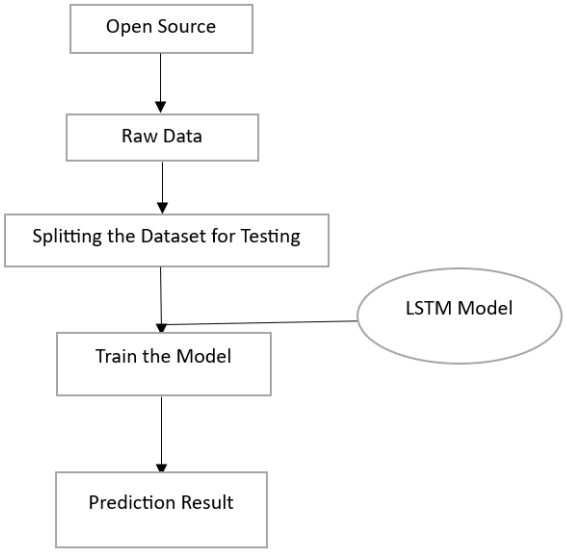


Fig:1 Overview of Model

IV. RESULTS

Using the Matplotlib library, a figure with two subplots that displays stock price data for a particular symbol ('EQIX') in the dataset was produced and it shows the range of the open, close, low, and high stock prices for the symbol 'EQIX' in the first subplot of a two-subplot figure. Which line relates to which kind of stock price can be determined with the aid of the legend IBM.

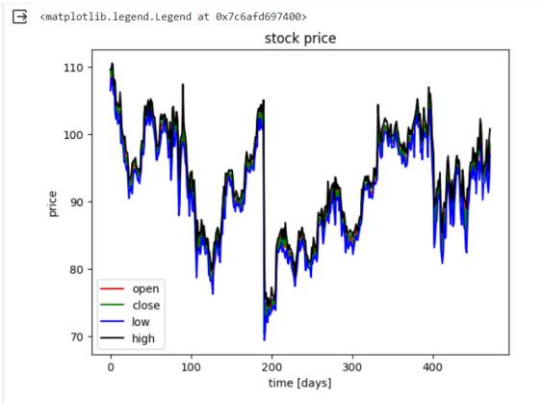


Fig: 2 Visualizing Stock Price.

The stock volume for the symbol 'EQIX' is shown over time in this subplot and add the stock volume for the ticker "EQIX" to the figure's second subplot.

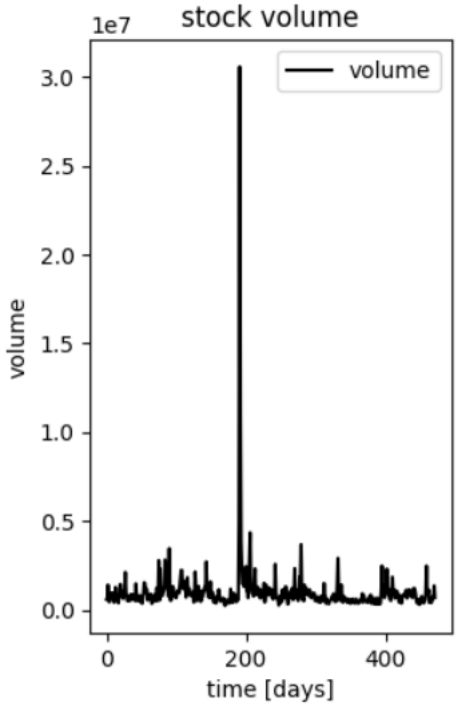


Fig: 3 Stock Price Volume

We have examined a set of data pertaining to IBM stock prices and analyze the High attributes for Prices.

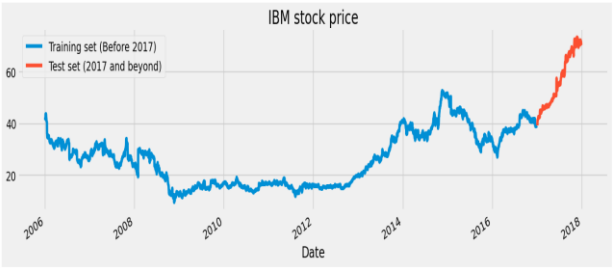
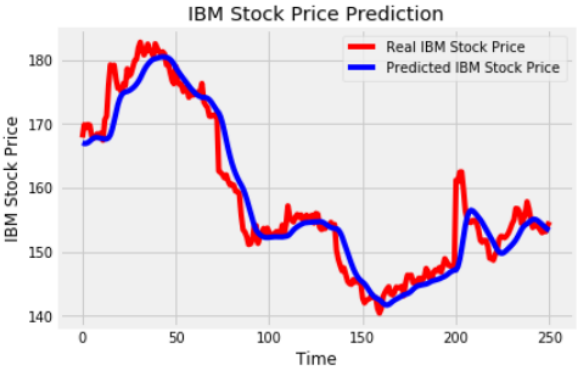
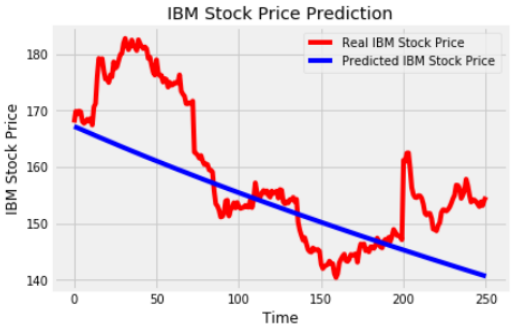


Fig: 4 Analyzing Company Stock Price

In the Above graph it is Representing the 2006 to 2019 Stock price it is lower to higher between 2017 training set.





The result is the variable predicted_stock_price, which contains the model's predictions for the stock prices on the test data, in the original scale. The predicted stock prices are inversely transformed to the original scale and a scaler, which was probably used to scale the data before training the model.

V. CONCLUSION

In this Paper We have Analyzed the LSTM using RNN and also Analyzed the IBM Company Stock Prices and essential components of a study on LSTM-based stock price prediction.

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