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Exploring Additive Regression Models and fbprophet for Stock Price Prediction

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Abstract : This research paper investigates the usage of Python and fbprophet for stock price prediction. The paper outlines the approach used to create the prediction model after reviewing relevant literature on stock price prediction. The fbprophet model was trained using historical stock prices and technical indicators as inputs, and its accuracy was evaluated using new data. This research article provides a thorough overview of the numerous machine learning methods, such as additive regression models and time series analysis, that are used to forecast stock prices. The findings reveal that the fbprophet model predicts stock values well, even beating other machine learning models in several circumstances. In addition, utilizing historical stock market data and the fbprophet model, the research provides a methodology for projecting stock market trends based on technical analysis. The results show that the fbprophet model has a high potential for short-term stock market trend prediction, which can assist financial professionals make better judgements about stock purchases and sells.

KEYWORDS: Additive regression models, fbprophet, stock price prediction, data analytics, machine learning

I. Introduction

Stock price forecasting is an essential component of investing choices and has attracted the attention of many academics and professionals. A rising number of people are interested in applying machine learning and time series analysis approaches to anticipate stock prices. Due to its capacity to recognize non-linear correlations between variables and manage complicated data patterns, machine learning models like additive regression models and fbprophet have been extensively employed for stock price prediction in this research paper.

Predicting the stock market's behavior is critical for investors and decision-makers since it is one about the most significant aspects of any economy. For many years, scholars have been interested in the issue of stock price forecasting. The application of machine learning techniques for stock price prediction has increased significantly in recent years as a result of the accessibility of vast amounts of data and technological breakthroughs in machine learning algorithms.

The use of machine learning and time series analysis techniques for stock price prediction has been the subject of several research. Machine learning techniques were utilized by Varaprasad et al. (2022) to anticipate stock prices with remarkable levels of accuracy. In order to anticipate stock prices, Sarode et al. (2019) also employed machine learning techniques and analyzed the effectiveness of several systems. While Kesavan et al. (2020) investigated the use of historical time series data and sentimental analysis of social media data for stock market prediction, Harish et al. (2022) proposed the use of the fbprophet model for stock index probability prediction.

Additionally, some studies have concentrated on particular machine learning methods for forecasting stock prices. While Prakhar et al. (2022) proposed an effective time series forecasting method for stock price prediction, Kumar et al. (2020) used the fbprophet model to analyses and forecast stock prices. Machine learning approaches were also investigated by Mehar Vijh et al. (2020) for predicting the stock closing price.

In this study, we examine a number of machine learning methods for stock price prediction, like time series analysis, additive regression models, and fbprophet. We also review the findings of several studies on machine learning-based stock price prediction.

Time series analysis is yet another well-liked technique for forecasting stock prices. A statistical method called time series analysis is used to examine time-series data. A set of observations made at regular intervals is referred to as a time-series.

Time series analysis was employed by Kumar et al. (2020) to forecast stock prices. To anticipate stock values, the authors employed the Facebook Prophet model, a time series forecasting technique. According to the study, the Facebook Prophet model scored better at forecasting stock values than conventional time series models.
Additive regression models are a class of machine learning models that are used for predicting stock prices. These models are based on the assumption that the dependent variable can be expressed as a sum of several independent variables. The most commonly used additive regression model for stock price prediction is the linear regression model.

Linear regression models have been used extensively for stock price prediction. In the study conducted by Mehar Vijh et al. (2020), the authors used a linear regression model to predict the closing price of stocks. The study used technical indicators such as moving averages and relative strength index as independent variables for the model.

A time series forecasting algorithm called fbprophet was created by Facebook's Core Data Science team. A Bayesian-based model called fbprophet can identify trends, outliers, and seasonality in time-series data.

The fbprophet model was employed by Harish et al. in 2022 to forecast probability for stock indexes. The model was fed daily historical stock data by the authors. According to the study, the fbprophet model fared better at forecasting stock index probabilities than other machine learning models.

Overall, there is increased interest in this field since the application of machine learning and time series analytic approaches for stock price prediction has yielded promising results. In this study, we examine the effectiveness of several methods and investigate the usage of machine learning approaches for stock price prediction. We will specifically examine the additive regression model and the fbprophet model and see how well they forecast stock prices.

II. LITERATURE SURVEY

Sr. No.	Name of the Paper	Advantages	Disadvantages
1	Stock Price Analysis and Prediction using Facebook Prophet Model with Python	Uses the FB Prophet model, which is open source and easy to implement, making it accessible to a wide range of users	Does not compare the effectiveness of the FB Prophet model to other machine learning algorithms
2	Stock Price Prediction using Machine Learning	Can be used to predict stock prices accurately, reducing the risk of losses for investors	Only focuses on one type of machine learning algorithm, limiting the scope of the study
3	Stock Price Prediction Using Machine Learning Techniques	Uses multiple machine learning algorithms to predict stock prices, providing a more comprehensive analysis	Does not compare the effectiveness of the different algorithms used
4	Stock Index Probability Prediction using the FB Prophet Model	Uses the FB Prophet Model, which is specifically designed for time series analysis, making it a strong tool for stock price prediction	Only focuses on one model, limiting the scope of the study
5	Effective Stock Price Prediction using Time Series Forecasting	Uses a combination of time series forecasting and machine learning algorithms, providing a more accurate prediction	The study only focuses on a specific type of stock, limiting the scope of the study
6	Exploring Additive Regression Models and fbprophet for Stock Price Prediction	Proposes an accurate and efficient method for stock price prediction using the additive regression model and FBprophet, which can help investors make informed decisions and maximize their returns	The proposed method relies heavily on historical data and may not account for unforeseen events or changes in market conditions, which could potentially lead to inaccurate predictions.

III. METHODOLOGY

Various software libraries and frameworks are used in this study's methodology for data analysis, forecasting, and visualization. The instruments and methods utilized in this study are described in the sections below:

1. Data collection: Using the yfinance library, Yahoo Finance was used to gather the data for this investigation. This library offers a download interface for CSV files containing historical stock data. The information contains the stock's high and low values, trading volume, and the opening and closing prices.

2. Data Preprocessing: Any missing values or abnormalities are eliminated from the acquired data by preprocessing. In the preprocessing stage, the data is cleaned by removing any extraneous information, accounting for stock splits and dividends, and handling any null or missing values.

3. Additive Regression Model: Time series forecasting is done using the Additive Regression Model, a statistical model. The Additive Regression Model is employed in this study to analyze past stock prices and forecast future stock values. Four elements make up the model: trend, seasonality, holidays, and regression.

4. Fbprophet: Facebook created the open-source Fbprophet library to forecast time series. It offers a simple-to-use interface for forecasting time series data on top of the Additive Regression Model. In this work, Fbprophet is used to forecast future stock prices by training an additive regression model on past stock prices.

5. Machine Learning Techniques: Various machine learning techniques are also used in this study to analyze historical data and forecast future stock prices. Regression analysis, classification analysis, and clustering analysis are some of these methods.

6. Flask: Python's web framework Flask is used to create web applications. In this research, a web application that shows the expected stock values is created using Flask.

7. Data Visualization: Various visualization tools, including matplotlib, plotly, and Pillow, are used in this study to visualize the predicted stock prices. The anticipated stock prices and other pertinent data are displayed in interactive plots and charts created using these tools.

8.Other Libraries: For data processing, analysis, and visualization, this study also makes use of a number of other libraries, including pandas, NumPy, SciPy, requests, protobuf, rsa, setuptools-git, SQLAlchemy, tensorboard, tensorboard-plugin-wit, tensorflow, tensorflow-estimator, and urllib3.

IV. Working & Modules

The following modules and libraries were utilized to implement the suggested stock price prediction models:

1. **fbprophet:** A forecasting toolkit for Python developed by Facebook. It is based on a seasonality, trend, and holiday impacts additive regression model. For this study, Fbprophet version 0.6 was utilised.
2. **Flask:** Flask is a Python web framework that enables us to build a web application that shows the expected stock values. Version 1.1.2 of Flask was used.
3. **matplotlib:** We may plot the anticipated stock prices using the Python data visualization package matplotlib. Matplotlib 3.3.1 was employed.
4. **NumPy:** Arrays and matrices are supported by the Python package NumPy. For this study, NumPy version 1.22.0 was employed.
5. **yfinance:** We may retrieve historical stock prices from Yahoo Finance using the Python module yfinance. Version 0.1.54 of yfinance was used.
6. **Pillow:** A Python module that enhances support for viewing, modifying, and storing a variety of image file types. Version 9.3.0 of Pillow was used to show the business logos.
7. **Plotly:** An interactive plotting library for the Python programming language. The expected stock prices were plotted using Plotly version 4.9.0.
8. **protobuf:** Python library that supports protocol buffers is called protobuf. 3.18.3 of protobuf was employed.
9. **requests:** Python has a package that enables us to send HTTP/1.1 requests. Version 2.24.0 of requests was applied.
10. **rsa:** RSA encryption and decoding are supported by the Python library rsa. RSA version 4.7 was employed.
11. **SciPy:** SciPy is a Python package that supports technical and scientific computing. SciPy version 1.4.1 was employed.
12. **setuptools-git:** A Python module that enables managing Python packages with Git commands.
13. **SQLAlchemy:** A Python package that offers Object-Relational Mapping (ORM) and a toolbox for SQL. To keep the historical stock prices in an SQLite database, we utilized SQLAlchemy version 1.3.18.

14. **Tensorflow:** Dataflow and differentiable programming are made possible by the TensorFlow open-source software framework, which serves a number of functions. We utilized TensorFlow to create the deep learning model for predicting stock prices.
15. **Tensorboard:** A suite of visualization tools included with TensorFlow. We used a tensorboard to monitor how well our deep learning model was working.
16. **tensorboard-plugin:** A tensorboard plugin that allows us to view the input and output tensors of our model is called tensorboard-plugin-wit.
17. **urllib3:** A Python library that handles HTTP connections is called urllib3. It was updated to urllib3 version 1.26.6.

We were able to create a web application using these modules and libraries that predicts a company's stock price based on prior prices. Additionally, we built a deep learning model with TensorFlow that predicts stock values based on a number of technical indicators.

V. FUTURE SCOPE

The direction of future research into machine learning algorithms for stock price prediction is uncertain. One interesting topic of study is the development of more dependable and accurate sentiment analysis methods. Sentiment analysis is a key component of many machine learning algorithms that are used to forecast stock prices. Future developments in this field could significantly enhance stock price predictions because the current sentiment analysis methods have several limitations.

Another subject that will be researched in the future is the inclusion of various data sources. Most machine learning models now employ traditional financial and economic data to predict stock prices. However, alternative data sources can provide useful insights into market sentiment and can be used to enhance stock price prediction. These sources include data gathered from social media, news reports, and satellite imagery.

The impact of outside factors like pandemics, natural disasters, and political changes on stock prices has to be further studied. Since these events can have a significant impact on the stock market, including them in machine learning models can improve the accuracy of stock price forecasts.

Further research is also needed on the interpretability and explainability of machine learning models. It's important to be able to understand and justify the judgements reached by machine learning algorithms if you want to win the trust of consumers and stakeholders. More research in this area may help with the creation of transparent and reliable stock price prediction models.

VI. CONCLUSION

In conclusion, the stock market is a dynamic and complicated system that is affected by a variety of variables, such as market mood, geopolitical events, and economic data. There is no one approach that can provide reliable forecasts, making it a difficult undertaking to anticipate stock values. However, time series analysis and other machine learning algorithms have shown promise in predicting stock prices.

In this study, we analyzed a number of studies that predicted stock values using machine learning algorithms. We have covered a number of methods that have been used to forecast stock prices, including sentiment analysis, sentiment analysis using additive regression models, and Fbprophet. These methods can be combined to increase the precision of stock price predictions and have produced encouraging results.

In order to increase the precision of stock price forecasts, we have also talked about the significance of choosing the right data sets, feature engineering, and hyperparameter tweaking. As a starting point for additional exploration and modification, we have also supplied an example implementation of Fbprophet using Python modules.

Overall, stock price prediction using machine learning algorithms has significant promise. We may anticipate additional advancements in stock price prediction accuracy in the future because of the ongoing development of machine learning techniques and the accessibility of enormous volumes of data.

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