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Forecasting Stock Market Index using Artificial Intelligence

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ABSTRACT

In this project, we attempt to implement the most popular Deep Learning technique for Time Series Forecasting since they allow for making reliable predictions on time series in many different problems. Instead of dealing with the data points collected randomly, we are using Time Series model to work upon a sequence of data points at a particular time interval. We are using three major modules to forecast the data, and they are Streamlit, Yahoo Finance, and Facebook Prophet. The user can select the number of years according to their convenience for prediction. The data is collected by yfinance and plotted using a python library called Plotly. Each point on the graph represents the date and the opening and closing stock prices for the share market. Based on the historical data we used fbprophet to forecast the stock quotes for the near future. The concerning forecast components like trends and weekly and yearly variations are also plotted. It helps to analyse the prices at a closer range and study the records effectively. This project aims to ease the problem of trading that is faced by Financial Investors.

Keywords:-*Stock, Time Series, Neural Networks, Prophet, yfinance*

INTRODUCTION

Stock market analysis is the act of determining the future value of a company's stock traded on an exchange. A stock market is an important part of the economy of the country as it has a major role in the industrial and commercial growth of the country.

Both investors and industry are involved in a stock market and want to know whether some stock will rise or fall certain period of time. It is based on the concept of demand and supply if the demand for a company's stock is higher the company share price increases and if the demand for the company stocks is lower than the company share price decreases. [5]

Another motivation for building a project in this field is that it possesses many theoretical and experimental challenges, most important of this is an efficient market hypothesis, the hypothesis says that in an efficient market stock market prices fully reflect available information about the market and its constituents contain and thus any opportunity of earning excess profit ceases to exist.

Due to the involvement of many numbers of industries and companies, it contains a very large set of data from which it isn't easy to extract information and analyse the trend of the work magazines.

Stock market analysis and prediction will reveal the market patterns and predict the time to purchase stock making a significant profit. The prophet is an additive regression model that detects the changes in the trend and patterns through data points, which helps predict the future curves. [3]

Investing in a good stock but at a bad time can have disastrous results. While investing in stock at the right time can bear profits. Financial investors of today are facing this problem of trading that do not properly understand which stock to buy and which stock to sell in order to get an optimum result for the purposed project will reduce the problem with suitable accuracy faced in such real-time scenario.

PREVIOUS WORK

Stock Market analysis and Prediction are done using Artificial Neural Networks. This project used Backpropagation Algorithm for forecasting stock prices, returns, and stock modeling.

The project was built for Nepalese users as the data they used for stock quotes belonged to the companies like Nepal Stock Exchange Ltd. In this project statistical analysis was used to develop a relationship between selected factors of Neural Networks and share prices to forecast the data. [1]

This research study includes Doc2V used in building long textual features from social media and then reforming their vectors with the help of an auto-encoder to create a balance between the dimensions of stock index and textual feature variables. The random noises generated due to stock market fluctuation are eliminated from the Time Series model. The project uses the LSTM model to predict future data. [6]

In this research paper, the authors have used Artificial Neural networks and Random Forest techniques. They have considered five companies to predict their next day's stock market closing price. Different variables of the stock are used for creating new variables which are used as inputs to the model.

Two standard strategic indicators that the research paper involved are RMSE and MAPE. The lease value of these indicators makes predicting the prices of a particular stock quote efficient. [7]

The authors of this research paper have applied a neural network-based model (ANN) to predict stock prices. The paper shows ways to predict a stock quote i.e. of NASDAQ's using the ANN model. The data input taken for prediction is from the years 2012 and 2013. It focuses on the trends in the stock prices, particularly of NASDAQ. The prediction also helps in evaluating the performance of the stock index. [8]

METHODOLOGY

The project design process flow for the stock price prediction consists of the flow diagram of prediction of stock price at different stages. These steps consist of data collection, data pre-processing, and data transformation.

The user will have the choice to select a particular stock quote name from the drop-down in which they are interested to invest, for example, GOOG abbreviated for Google. They then can select the number of years to obtain the result of forecasted data from the range of one to four, for example here two. After selection, the data is loaded into a database from yahoo finance, and raw data will be plotted with Plotly.

The fetched data shows the recent variations in the stock prices. Values for various terms like Open, Close, High, Low, and Adjacent close are defined. Through range sliders, users can closely see the variations in the plot. Based on these historical data, the future data for the number of years chosen will be forecasted using the Times Series model fbProphet. The resulting data will be plotted and weekly, monthly, and yearly components of it represent the close variations observed.

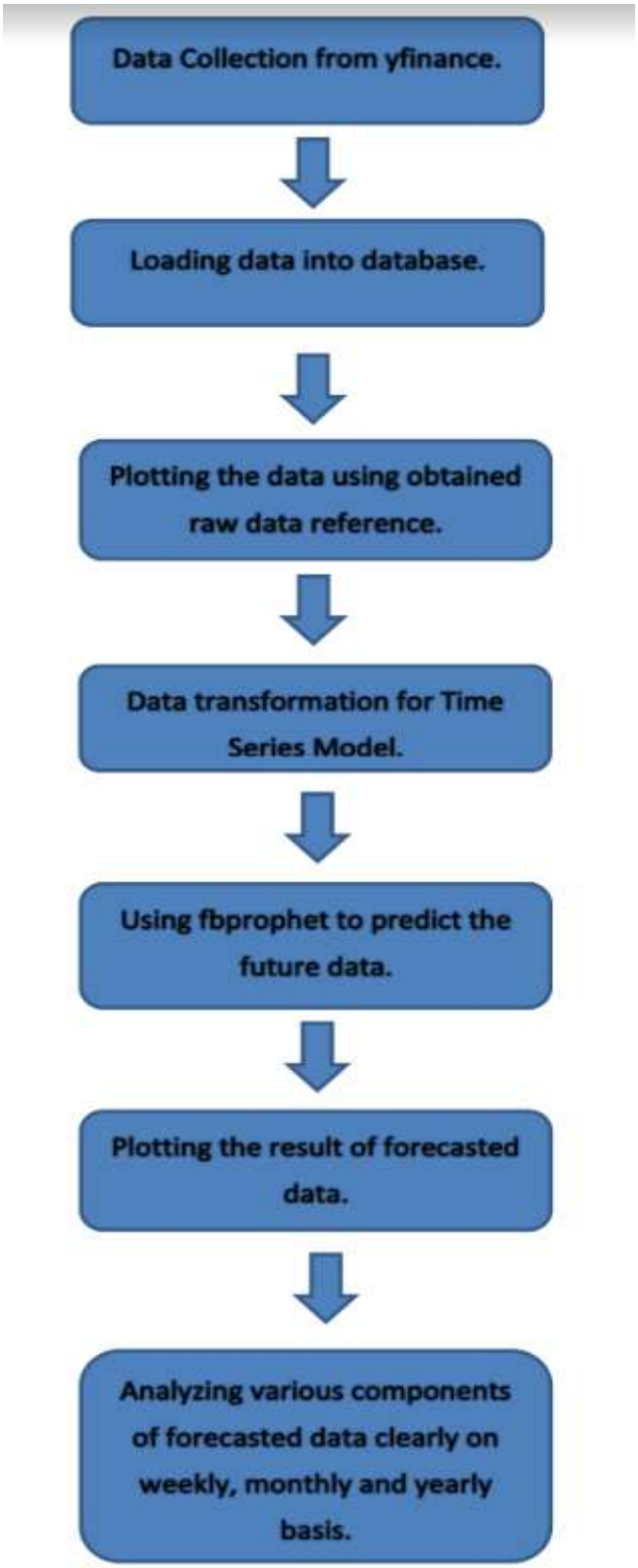
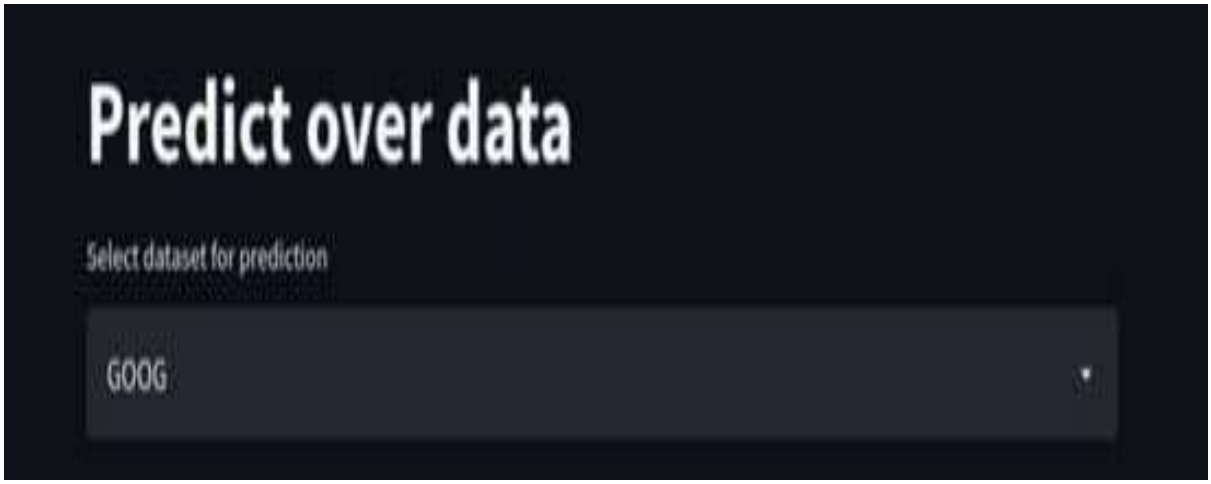
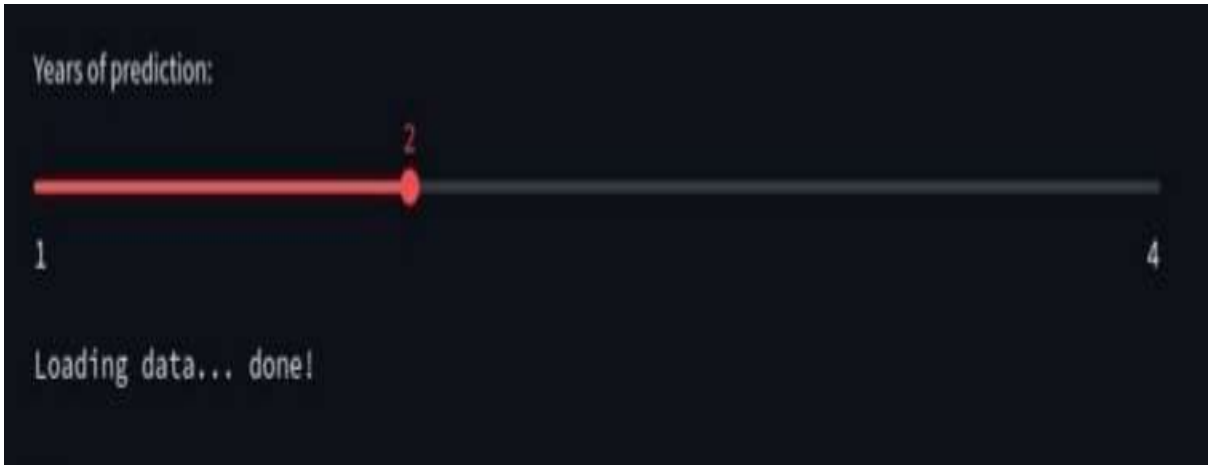


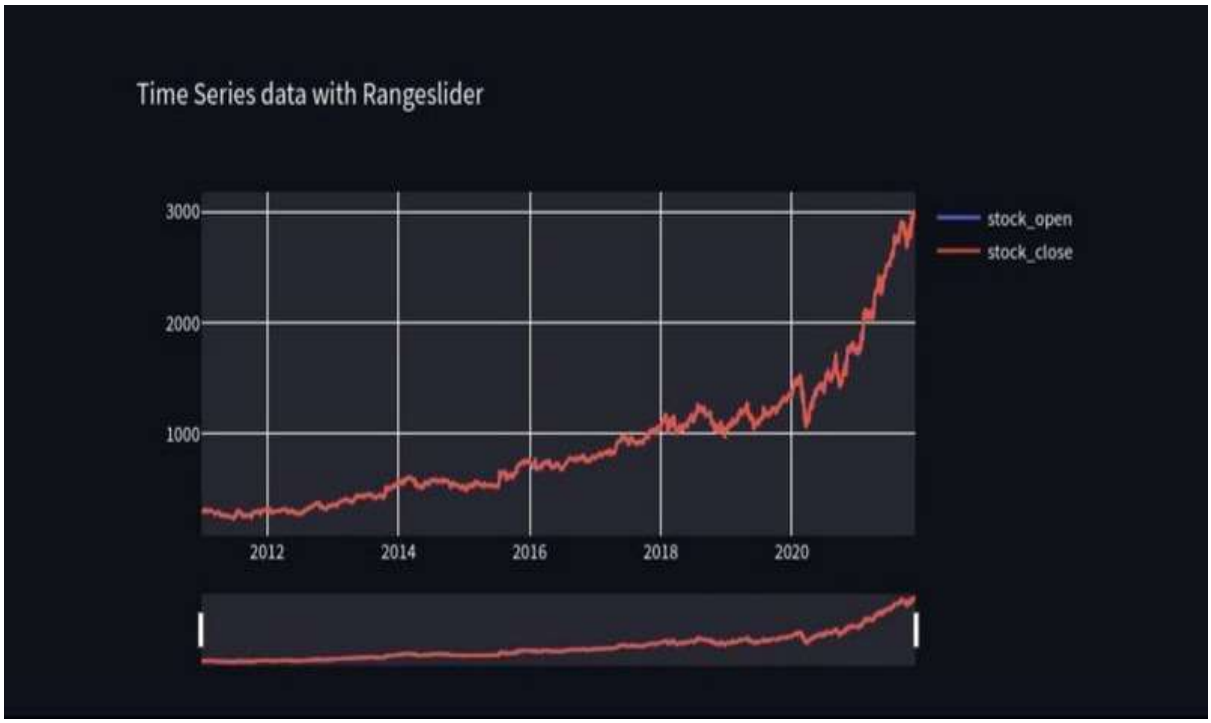
Fig.1:-*Process flow of the project*





Raw data

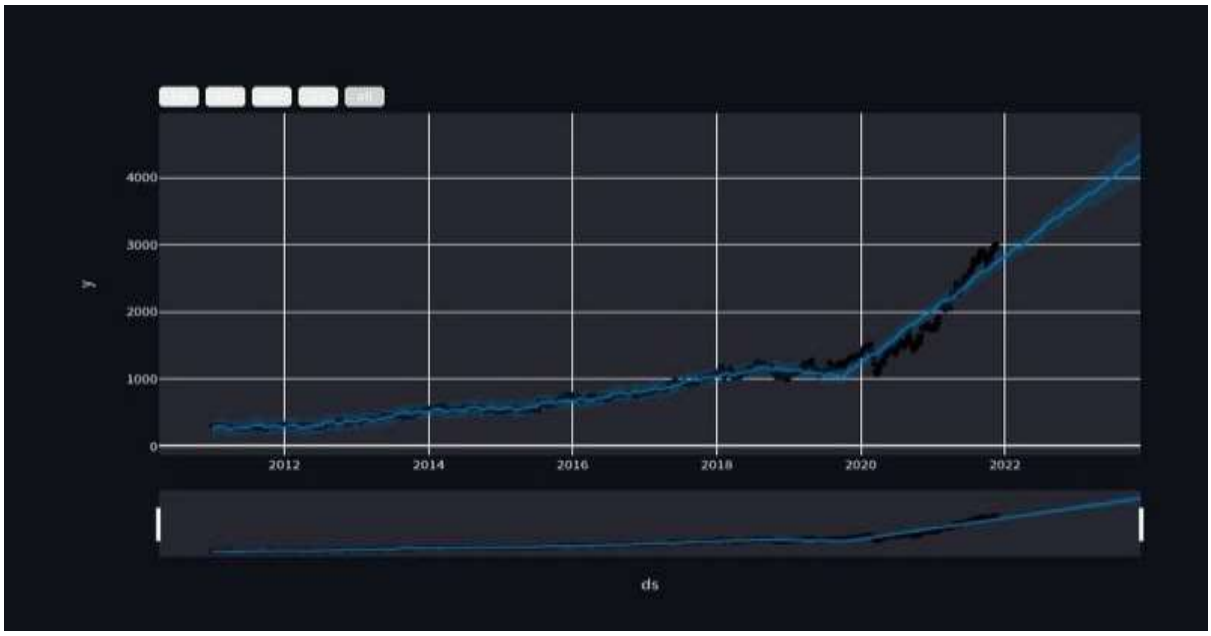
	Date	Open	High	Low	Close	Ad
2737	2021-11-15T00:00:00	3,000.0000	3,009.5400	2,973.0500	2,987.7600	2,9
2738	2021-11-16T00:00:00	2,983.4099	2,996.6499	2,967.0000	2,981.5200	2,9
2739	2021-11-17T00:00:00	2,984.5801	2,992.5200	2,971.2600	2,981.2400	2,9
2740	2021-11-18T00:00:00	2,982.9199	3,032.2000	2,979.9700	3,014.1799	3,0
2741	2021-11-19T00:00:00	3,020.0000	3,037.0000	2,997.7500	2,999.0500	2,9



Forecast data

	ds	trend	yhat_lower	yhat_upper	trend_lower	tren
3467	2023-11-15T00:00:00	4,310.9048	3,948.0794	4,680.1560	3,950.3957	
3468	2023-11-16T00:00:00	4,313.0801	3,941.8723	4,696.3605	3,951.8740	
3469	2023-11-17T00:00:00	4,315.2554	3,951.2605	4,688.2202	3,952.9237	
3470	2023-11-18T00:00:00	4,317.4307	3,963.7484	4,682.5840	3,953.6790	
3471	2023-11-19T00:00:00	4,319.6060	3,956.8239	4,671.8281	3,954.4343	

Forecast plot for 2 years



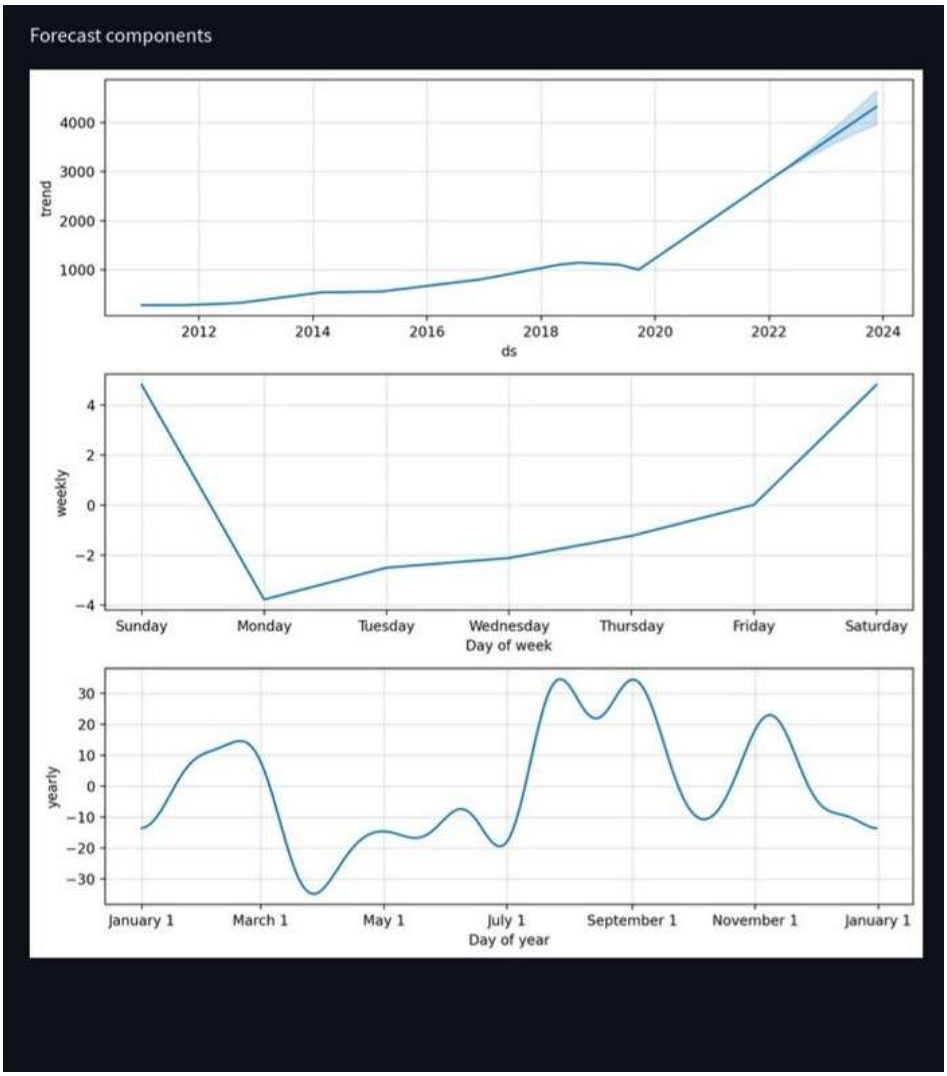


Fig.2:-*Snippets of the web application*

CONCLUSION

In this project, we implemented the Time Series Model and Artificial Intelligence. To predict the stock prices of different companies we made use of Yahoo Finance's collected data and predicted the results on the basis of past records.

Prophet also takes care of variations at specific durations of year for example any festival when the stock prices are high or during the war when stock prices go down.

We have created a GitHub Repository that contains all the essential information and files concerning the project. Also, deployed the web application and attached the link for further reference. It is an open-source project where we can update the technologies and tools used according to the demand.

Our project has a future scope and some of the enhancements are listed below:-

- The data collection and analysis method can be improved.
- If in the future a more accurate model emerges for forecasting the data, then application of the same in the project can be done.
- We can include more options in our drop-down section giving users a wide variety of options in stock quotes of companies.
- If the stock price information of the companies in the data set is continued until next year, then it is possible to see the rise and fall of the stock price of the respective companies due to the COVID-19 pandemic.

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