STOCK PREDICTION

Introduction

As stock market predictions are a complex topic to tackle, the main cause for most inaccurate predictions is due to the sudden rise & fall of the market with great precision. By incorporating Deep Learning Models into this project, we are able to use a best-fitted model to appropriately view & analyze results.

The focus for this project is to predict future prices post Covid-19 based on live data from an API. The period by which we look back upon for the models' build dates back to early 2018. The data that is to be predicted is set for 200 days into the future.

Index Terms— *Stock Market, Stock Price Prediction, Prophet, Python, dash, LSTM.*

Problem statement

To make investment decisions, investors should be aware of how the stock market works. If investors invest in a well-known company stock at a bad time, He may face consequences of that, investing in an ordinary stock at the right time can bear profits. The problem that investors are facing in trading is that they do not have a good understanding of which one to buy or to sell to get a good amount of profits. As the stock prices fluctuates on hourly basis so predicting long term value can be uncomplicated.

A stock exchange market displays savings and investments that are beneficial to increasing national economic effectiveness. The publicly available information of current and historical stock market indices has some predictive links with future stock returns. Based on the previous relationship, investors choose the finest moment to sell, purchase, or keep a company in the stock market. Whether a long-term investor or a day-trader, every investor is interested in predicting future stock values. This is a significant problem in terms of designing and developing an effective and efficient forecasting model that aids investors in making informed decisions.

Related work

Forecasting stock returns is an important financial topic that has captivated the researcher's mind for many years. Investors in the stock market have been striving to find a solution to estimating stock trends in order to determine the best time to purchase, sell, or hold a stock. Stock trend forecasting has been done using both qualitative and quantitative analyses. There are several statistical models available for forecasting stock trends, and the format of the data influences which model is best for a forecasting application.

We develop a prediction model for time series stock market data in this paper. This program will automate the process of changing stock price indices based on technical analysis and will assist financial experts in determining the best time to buy and sell companies.

For stock prediction, we developed prediction models such as CNN LSTM, GRU, and linear regression, as well as using dash for user interface and prophet forecasting for future data prediction, and Python programming language for visualization of results.

Understanding the objective

Knowing the objective, which includes an understanding of the system's intent and basics, is the first stage in establishing a project. This comprehension serves as an issue description as well as a system for preparing to meet the expectations. Our project's goal isn't to create a system that makes billions, nor is it to create a system that wastes billions. However, the goal is to create a system that determines the direction of change of stock price indices based on correlations between stock prices and assists stock market investors in deciding whether to purchase, sell, or keep a stock by presenting visualizations of the results.

Solution

Tried using different deep learning models such as LSTM, combination of CNN-LSTM and GRU to predict the stock price. Implemented web based user interface using fbprophet method to see the future prediction of different company stocks using dash web framework.

Datasets

Data that we are collecting which includes processing initial data observations in order to extract the valuable subsets from hidden information possibilities. The data is collected from Yahoo Finance website using a Python script. https://finance.yahoo.com/. Dataset consists of columns ‘Open’, ‘Close’, ‘High’, ‘Low’, ‘Adj Close’. Below figure shows the apple company ‘Open’ price visualisation before covid.

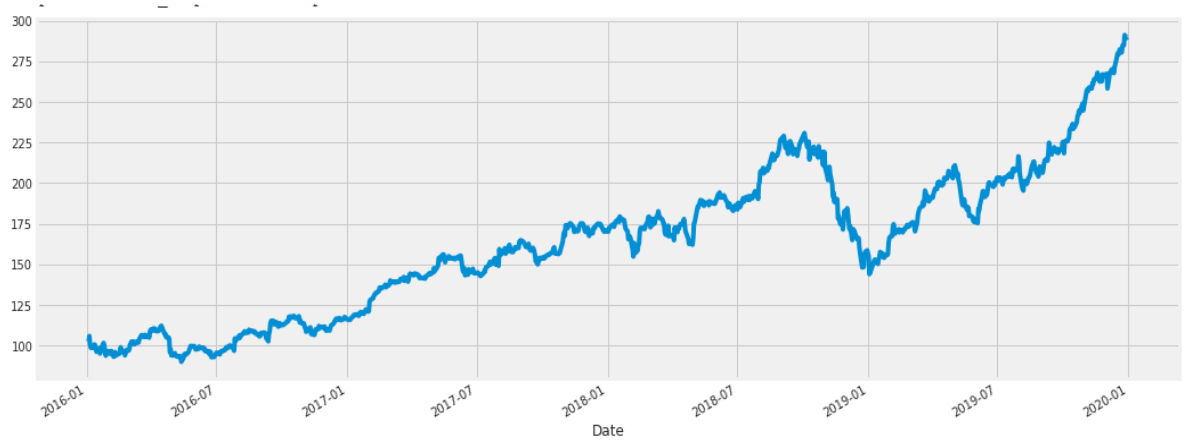
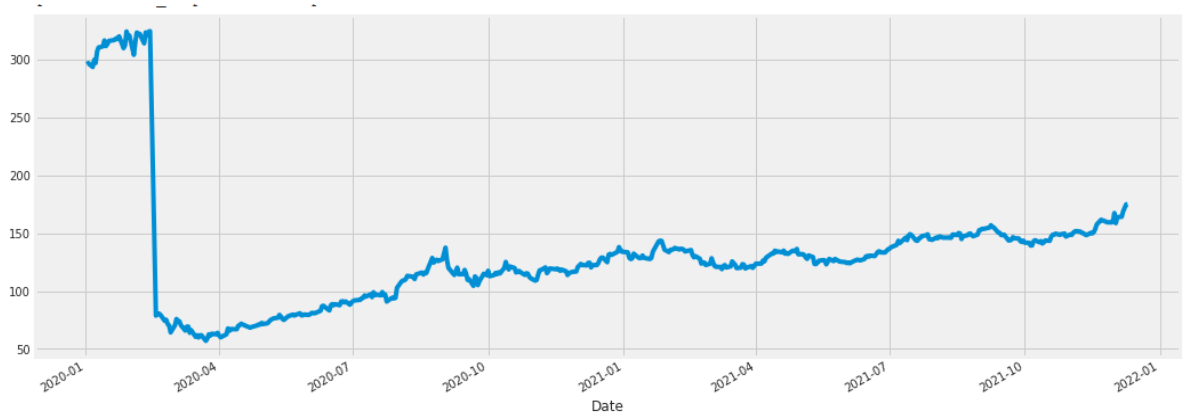


Figure shows Apple company stock price during Covid



Preprocessing

To preprocess our data first we checked for Null values. Upon checking there were no null values. We did normalization of data using MinMaxScalar so the minimum values of features were transferred to 0 and max values transformed to 1.

Methodology

We have experimented with different models to choose the best model to predict future stock prices. We tried deep learning models such as LSTM, CNN-LSTM and GRU These models are discussed in detail further.

LSTM: Long Short Term Memory model. It is widely used in time series forecasting of data. In our implementation we have used 3 layers of LSTM with 512,128 and 64 units. Followed by dropout layers to avoid overfitting of data. We used 'adam' optimizer to compile and train the data and ran over 10 epochs. To evaluate the model performance we calculated MAE, MSE, RMSE and R-squared values.

CNN-LSTM: We tried to implement a combination of CNN-LSTM models together and we got good results compared to the rest of the model that we implemented. The CNN-LSTM can deliver realistic stock price forecasting with the maximum prediction accuracy. We have used 2 layers of Conv1D layer with filters of 128, 256 and 2 layers of LSTM with 100 units.

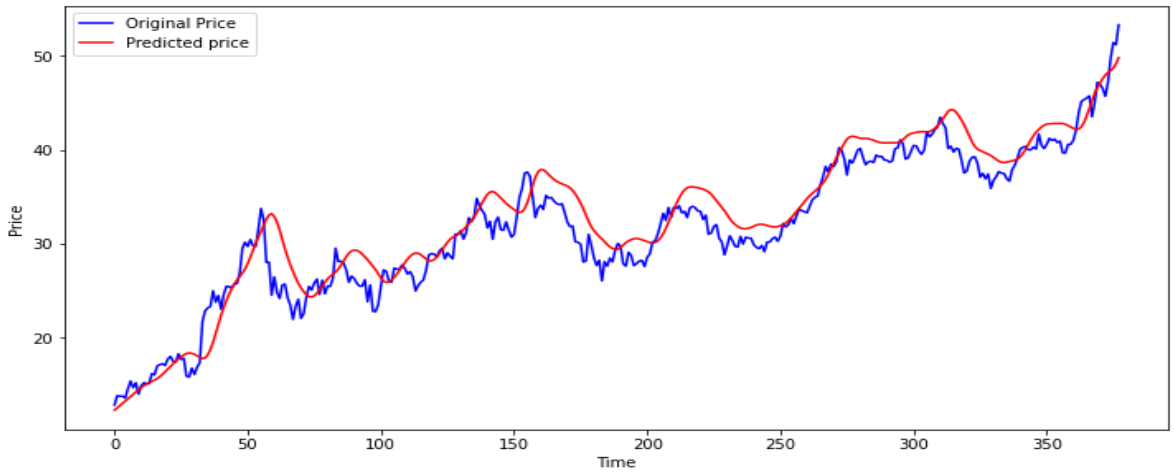
GRU: GRU helps in back propagation via immediate historic values as well as current prices and be more accurate in detecting a developing trend. Used 3 layers GRU followed by dropout layer to avoid overfitting. Total 1,074,881 parameters were trained.

Post-processing

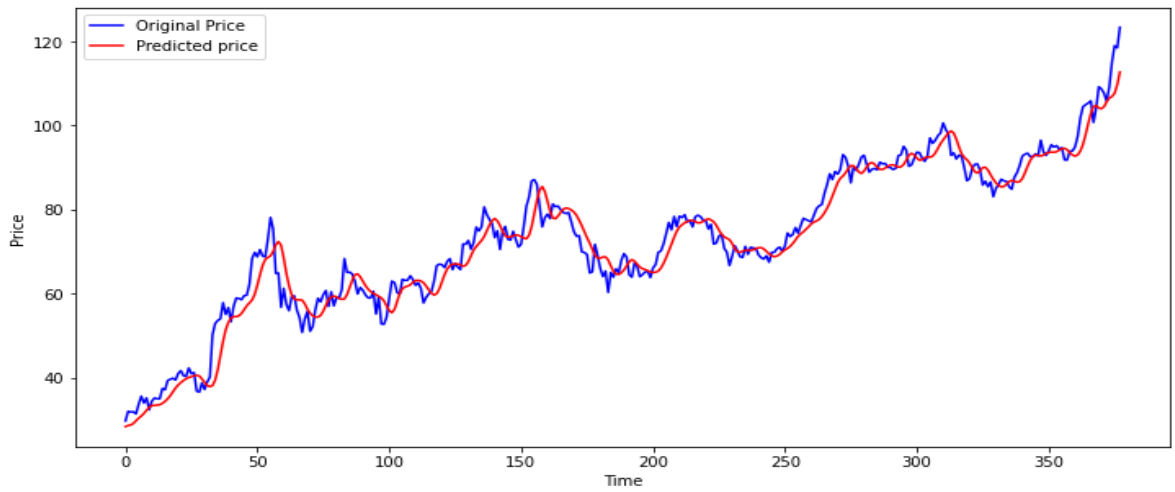
After training the models we calculated the model performance using MAE, MSE, RMSE & R-squared matrix.

LSTM model performance values
MAE: 4.15 MSE: 20.59 RMSE: 4.53 R^2: 0.0036

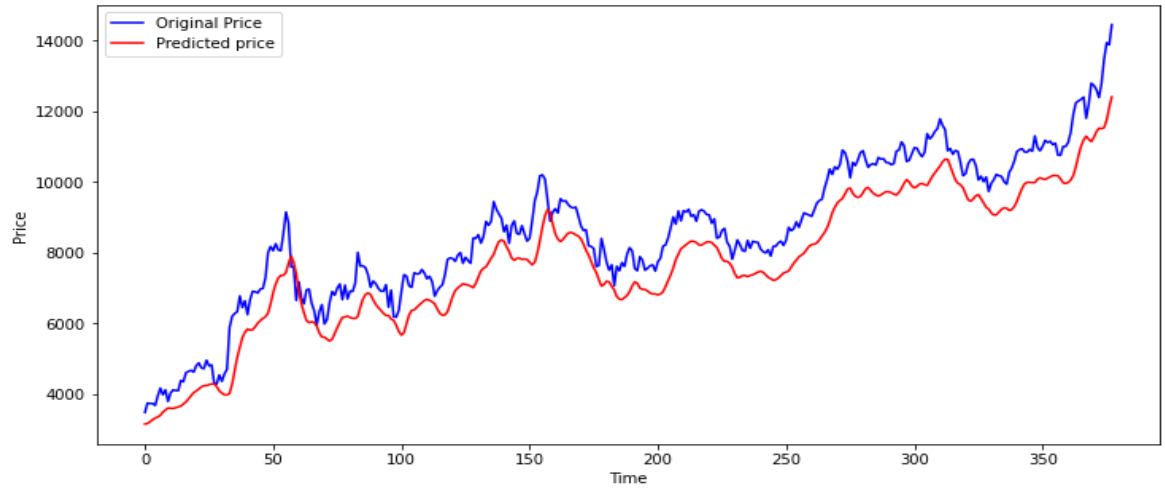
Below figure shows the original price and predicted price graph



CNN-LSTM model performance
MAE: 3.34 MSE: 18.12 RMSE: 4.25 R^2: 0.0028



GRU model Performance
MAE: 7.40 MSE: 65.014 RMSE: 8.063 R^2: 0.0031



Web Application

Forecasting is the practice of making predictions about the future based on historical and current facts. Stock analysts utilize a variety of prediction tools to assess the worth of future stock trends. Prediction also serves as a valuable benchmark for organizations with a long-term view of their operations. We utilize the 'forecast' package to forecast future stock patterns based on historical data. This 'forecast' package includes numerous forecasting functions, as well as exponential smoothing and spatial models, for visualizing time series forecasts.

In technical evaluation, to predict market patterns, investors use auto regressive and moving average models. Forecasting is a crucial element in this process. The PROPHET model is used to process the data

Prophet makes it much easier to come up with a realistic and accurate forecast. Many alternative forecasting algorithms (ARIMA, exponential smoothing, etc.) are included in the forecast package, each with its own set of strengths, limitations, and tuning options. We've discovered that selecting the incorrect model or parameters can lead to bad outcomes, and that even experienced analysts can struggle to select the best model and parameters given the variety of options.

Non-experts will appreciate how easy it is to customise Prophet forecasts. Smoothing parameters for seasonality and trends allow you to control how closely you want to fit historical cycles, as well as how aggressively you want to follow previous trend changes. You can manually select "capacity" or the top limit of the growth curve for growth curves, allowing you to integrate your own historical data on how your forecast will increase.

Below figure shows the Apple stock forecast for next 200 days

Conclusion:

In this research, we attempted to create a prediction model for projecting stock market trends utilizing historical time series stock market data based on technical analysis. For business experts, determining stock market forecasts has always been a challenging task. As a

result, the Project uses Deep Learning models to estimate stock price forecasts and achieve a positive outcome. We tried with different models to predict the stock price. Out of all predicted models we got best results for CNN-LSTM model.

References

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