

Deep Learning for Arbitrary Stock Forecasting

Ms. Project Proposal

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Abstract

The aim of this project is to create a deep learning model to predict stock market prices of different brands. The project will involve applying different deep learning models on the historical data of brands available and predicting the prices of stocks on basis of that. Implementation of different models for forecasting will be done in combination with different deep learning techniques in order to compare and get best results. We will be comparing models like LSTM to newly created models like Neural Prophet. The architecture will be mostly based on neural network for repetitive training to get good results e.g. RNN, ANN

Keywords: RNN, ANN, LSTM

1 Introduction

The stock market is a dynamic and complicated system that may be impacted by a variety of things, including corporate news, geopolitical events, economic indicators, and emotion on social media. Public corporations can raise funds by selling their shares to investors on the stock market. Stocks are available for purchase by investors, and people try to buy the shares which turns out as a transaction which can benefit one or other party depending on the decision. The stock market is a gauge for the state of the economy as a whole and is an essential component of the global financial system and acts as¹.

Due to the market's unpredictability and the enormous quantity of data involved, stock market forecasting is a difficult task to accomplish. It can be impacted by a variety of things, including corporate news, geopolitical events, economic indicators, emotion on social media, political developments, business news, and economic indicators also have an impact on the stock market.².

With the advancement in machine learning techniques, it is feasible to evaluate huge data-sets and create precise and accurate future prediction models. The purpose of this project is to create a Deep learning-based stock market forecasting system. The suggested system will examine past data to find patterns, trends, and correlations, then utilize that information to predict the future forecast for stock market.

2 Literature Review

The objectives of this session are as follows:

1- To determine the various sentiment research techniques utilised in stock market forecasting.

2- To make suggestions for further study in the area of stock market forecasting using sentiment analysis.

3- To evaluate sentiment analysis's constraints and difficulties in stock market forecasting.

4- To evaluate sentiment analysis's accuracy in predicting stock prices.

There have been extensive research done on stock market prediction, applying different methods and approaches for example a research done on the twitter data³ came to a conclusion that the accuracy of the predictions is directly dependent on the quality of the data-set itself. Use of ANNs can improve results significantly⁴, but it has its own dependencies, for example the methodology being used, architecture of program and also the input features. Also combination of fundamental analysis along with ANN was proven to be providing good and reliable results⁵. There's another methodology which is quite similar but uses Genetic Algorithms in combination with ANN⁶

Not only ANN but there are also other neural network algorithms available and being widely used for the prediction of stock market mainly, RNN and CNN and also other machine learning algorithm⁷⁸⁹. There is still more research needs to be done to learn more about new algorithms and to implement them for example Facebook Prophet which is relatively new in comparison to other algorithms¹⁰.

3 Background

3.1 Problem Statement

Despite improvements in the field of stock market forecasting, it is still difficult to anticipate how the stock market will move in the future. The stock market is impacted by a wide range of intricate and interconnected factors. Investors face enormous risks as a result of the stock market's volatility and unpredictability, which could result in financial losses and market instability. Thus, it is vital to provide more precise and trustworthy stock market forecasting methodologies and tools to aid investors in making wise investment choices.¹¹.

3.2 Proposed Solution

Stock Market prediction is a complex problem which is combination of technical analysis, fundamental analysis, and market sentiment analysis. All of these have there on affects in the outcome of the program. Here are some of the steps that can be taken in order to tackle the problem at hand.

- 1- Compile and evaluate historical data: Compile historical information on the stock market, such as stock prices, trading activity, and other important financial measures. To spot trends and patterns in the data, use statistical and machine learning approaches.

2- Include fundamental analysis: To evaluate the financial standing of the companies whose stocks are traded, use fundamental analysis.

3- Monitor market sentiment: Keep an eye out for changes in investor sentiment that could have an impact on stock prices as stock market is mostly based on trends, by examining news stories, social media posts, and other sources.

4- Employ technical analysis: To spot trends in stock prices and trading activity that could point to future price moves and maybe new competitors jumping in.

5- Combine all analysis: To produce forecasts for future stock prices, combine the findings from the aforementioned analysis methods. Use machine learning algorithms to find the most important variables and produce predictions that are more accurate.

6- Evaluate model: A forecasting model's performance should be continuously assessed, and it should be improved as necessary to increase accuracy.

4 Methods

According to my understanding, there's a difference between architecture and model which I differentiate as following:

Architecture often refers to the entire layout and organisation of a system and how they work together internally. The functional and non-functional requirements of a system are defined in this section and also scalability and functional and non-functional constraints are defined.

A model is a method usually used to study the behavior of the certain architecture and how it's operating. Models can be used to spot possible problems or areas for improvement. They are frequently used to mimic or test various situations for the architecture to see how it's working.

Now on the basis of this prior knowledge that I have I will put a bit light on the Architecture and Model that I will be implementing in this project

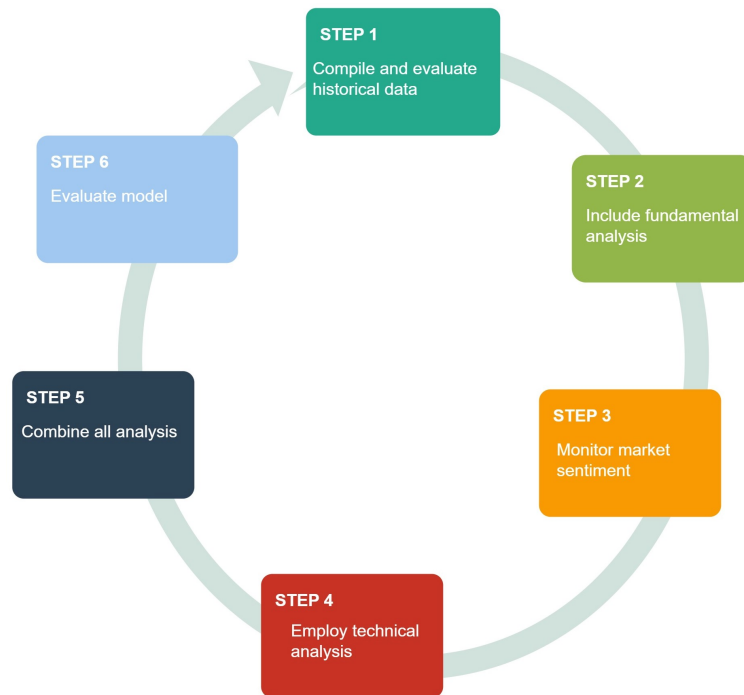


Figure 1. Proposed Solution

4.1 Architecture

Q 1. *What is going to be overall architecture of the system*

The goal is to implement different architectures available and compare them in order to come up with the best possible solution. The problem at hand is predicting the future events which can be quite difficult for general architectures. When we talk about the deep learning, we mostly refer to multi-layer architectures for example neural networks. Neural Networks are really good in terms of working with noisy data-sets and they are flexible in terms of modeling. Not only that, it is able to handle with high dimensional data which is a huge advantage as the stock market data-set can turn out to have various variables and features. We are going to apply mainly the following architectures.

a. RNN

b. ANN

4.2 Model

Q2. What are the most suitable models

Time series forecasting is a widely used method for predicting future trends and movements in stock prices. It involves using past stock market data to predict future forecasting. It is highly complex and is sensitive to what kind of information is fed to it as there are many variables effecting the future forecast for stock market as mentioned earlier. The methods we are going to apply are following:

a. LSTM

b. Facebook Prophet

5 Timetable

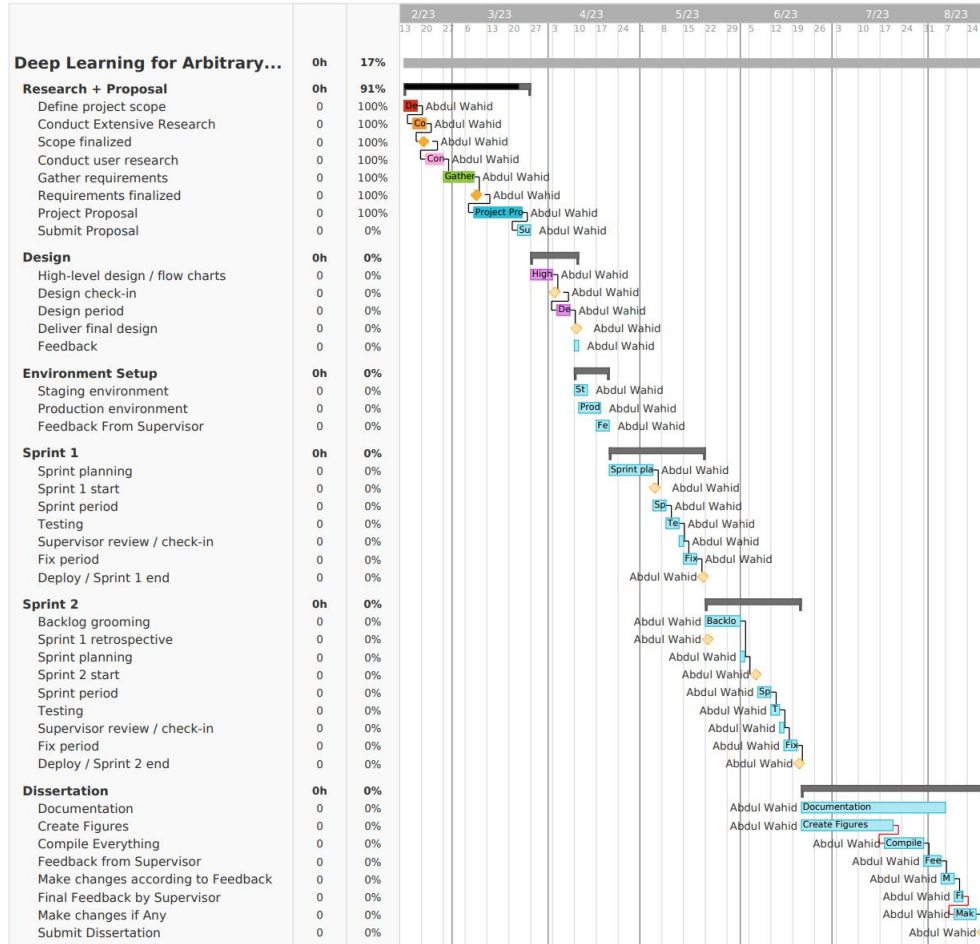


Figure 2. Gantt Chart

6 Evaluation

Assessing the accuracy of stock market predictions is the main goal of this whole project in order to figure out the best possible architecture to predict future stock prices.

These are few measures that can be used to assess the accuracy of stock market forecasting models:

1- Mean Absolute Error (MAE): This statistic assesses the predicting errors' average magnitude without taking into account their direction.

2- Directional Accuracy (DA): This measures the proportion of correct directional forecasts, that is, the percentage of times the model correctly predicts whether the stock prices will go up or down.

3- Root Mean Squared Error (RMSE): This measures the average magnitude of the forecasting errors, giving more weight to larger errors.

4- Mean Absolute Percentage Error (MAPE): This measures the average percentage difference between the actual stock prices and the forecasted prices.

7 Testing

The process of assessing the effectiveness of models trained to forecast stock prices is going to be dealt in testing. The techniques mainly include methods like Unseen sample testing, cross-validation, Back testing.¹² To estimate the outcome of potential results, these techniques analyse past market data, test models on new data and monitor the models performance over time. The steps for testing are given as follows:

1- Splitting your data: Create two sets from your data: a training set and a testing set. Use the testing set to gauge the model's performance once it has been developed using the training set.

2- Selecting evaluation metrics: Choose the metrics you'll use to gauge the effectiveness of your model. Mean squared error (MSE), root mean squared error (RMSE), and R-squared are a few typical metrics for regression issues.

3- Fit the model: To fit the model to the data, use the training set.

4- Evaluate the model: The testing set should be used to gauge the model's effectiveness. Calculate the assessment metrics you choose by comparing the anticipated values to the actual values in the testing set.

5- Refine the model: If the performance of the model is unsatisfactory, try modifying the model's parameters or characteristics. Till you obtain the desired performance, repeat steps 3 and 4.

6- Employ cross-validation: to make sure the model isn't over-fitting to the training data and that it is generalising effectively to new data. One such method is k-fold cross-validation.

7- Test the model on Untrained data :Once you have a final model that performs well on the testing set, you should test it on fresh data that it has never seen before to ensure that it is reliable and accurate.

The testing is an ongoing process which will be done along with every sprint and iteration. Another thing which I would like to again emphasize on, is the nature of the problem due to which the testing can not accurately measure the accuracy of the program as stock market can be effected by

many variables.



Figure 3. Testing

8 Goal

The primary goal of this project is to create a well designed and fully functional Stock Market forecasting system that is as precise and accurate as possible in order to get best predictions for future forecasting. This will help the investors to have a prior insight ion the stock market, Risk management, help them grow there per-folio, buy and sell shares depending on the current trends.

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