Stock Market Prediction

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I. ABSTRACT

Stock market prediction is the act of trying to determine the future value of a company stock or other financial instrument traded on an exchange. The successful prediction of a stock's future price could yield significant profit. Stock prediction has a high level of complexity involved and there exists no algorithm that can successfully predict stock prices to a 100 percent accuracy. The most prominent technique involves the use of artificial neural networks (ANNs) and Genetic Algorithms(GA). The most common form of ANN in use for stock market prediction is the feed forward network utilizing the backward propagation of errors algorithm to update the network weights. These networks are commonly referred to as Backpropagation networks. Another form of ANN that is more appropriate for stock prediction is the time recurrent neural network (RNN) or time delay neural network (TDNN). For stock prediction with ANNs, there are usually two approaches taken for forecasting different time horizons: independent and joint. The independent approach employs a single ANN for each time horizon, for example,1-day, 2-day, or 5-day. The joint approach, however, incorporates multiple time horizons together so that they are determined simultaneously. In this approach, forecasting error for one time horizon may share its error with that of another horizon, which can decrease performance. There are also more parameters required for a joint model, which increases the risk of overfitting. The predicted low and high predictions are then used to form stop prices for buying or selling. Outputs from the individual "low" and "high" networks can also be input into a final network that would also incorporate volume, intermarket data or statistical summaries of prices, leading to a final ensemble output that would trigger buying, selling, or market directional change. A major finding with ANNs and stock prediction is that a classification approach (vs. function approximation) using outputs in the form of buy(y=+1) and sell(y=-1) results in better predictive reliability than a quantitative output such as low or high price

II. INTRODUCTION

Stock Market is a term that refers to the collection of mar- kets and exchanges where regular activities of buying, selling of shares of publicly held companies take place. Predicting the stock market is the act of trying to determine the future value of a company stock or other financial instrument traded on an exchange. A successful prediction of a stock's future price could give the owner insight of the most optimal time to buy or sell more stocks thus yielding significant profit to the stock's owner. Most people have a tough time trying to predict the stock market by themselves, hence relying on an algorithm is more sought after. Having a reliable algorithm he stock market plays a play a pivotal role in the growth of the industry and commerce of the country that eventually affects the economy of the country to a great extent. That is reason that the government, industry and even the central banks of the country keep a close watch on the happenings of the stock market. The stock market is important from both the industry's point of view as well as the investor's point of view. Predicting stock performance is a very large and profitable area of study. The stocks market is one of the most important sources for companies to raise money and allows businesses to go public, or raise additional capital for expansion. Prediction of stocks can be done using multiple methods but we aim to produce a higher accuracy using Neural Networks.

III. LITERATURE REVIEW

Stock Market Prediction using Time Series Analysis
The proposed model follows prediction of stock prices using Time Series Methods that follows historical trends to make future predictions in trends. Stock Market Prediction using

Artificial Neural Network

An ANN is a network of nodes connected with directed arcs each with a numerical weight, w(i, j) , specifying the strength of the connection. This study was directed at finding the best and most efficient model for the prediction of Istanbul Stock Exchange market index values. Results were compared using the coefficients of determination for ANN models and using mean relative percentage errors for all of the models Time Series Data Analysis for Stock Market Prediction using Data Mining Techniques.

The future stock returns have some predictive relationships with the publicly available information of present and historical stock market indices. ARIMA (Auto-regressive Integrated Moving Average) is a statistical model, known to be very effective and efficient for time series forecasting especially for short-term prediction. In this paper, we propose a model for predicting the market trends based on the technical analysis using historical stock market data and ARIMA model. This model will automate the process of direction of future stock price indices and provides assistance for financial specialists to choose the better timing for purchasing and/or selling of stocks. The results are shown in terms of visualisations using R programming language. The best method available would be using Artificial Neural Networks rather than moving average or ARIMA Model.

Data Sets are to be selected from the NSE (National Stock Exchange) or BSE (Bombay Stock Exchange). A well supported database is required and divided into two parts viz: training set and testing set.

There already exists many models that attempt to predict stock values with high accuracy and precision. Our aim is to predict the stock values with a higher accuracy using these multiple methods. Out of all the neural network models RNN and LSTM is found to be the best method when dealing with numerical data.

IV. IMPLEMENTATION

A. Alogrithm

- ANN are deemed as streamlined mathematical models of brain-like system. They work as a parallel circulated computational network. However, contrasted with conventional computers, which are automated to perform specific tasks, most Neural Networks must be taught, or trained. They can acquire new relations and new configurations. Although computers outperform both biological and ANN for tasks based on precise and fast arithmetic operations, but ANN can generate the output for all other similar situations for which it is taught, where conventional computers cannot. The signal movement of neuron inputs, x_j, is measured to be unidirectional as specified by arrows, as is a neuron's output signal flow. The neuron output signal is known by the subsequent relationship.

- A recurrent neural network (RNN) is a class of artificial neural networks where connections between nodes form a directed graph along a temporal sequence. This

$$o=f(<w,x>)=f(w^T x)= f(\sum_{j=1}^{\infty} w_j x_j)$$

where $w = (w1, \ldots, wn) \in IR^n$ is the weight vector.

allows it to exhibit temporal dynamic behavior. Unlike feedforward neural networks, RNNs can use their internal state (memory) to process sequences of inputs. This makes them applicable to tasks such as unsegmented, connected handwriting recognition or speech recognition. Both classes of networks exhibit temporal dynamic behavior. A finite impulse recurrent network is a directed acyclic graph that can be unrolled and replaced with a strictly feedforward neural network, while an infinite impulse recurrent network is a directed cyclic graph that can not be unrolled. Both finite impulse and infinite impulse recurrent networks can have additional stored state, and the storage can be under direct control by the neural network. The storage can also be replaced by another network or graph, if that incorporates time delays or has feedback loops. Such controlled states are referred to as gated state or gated memory, and are part of long short-term memory networks (LSTMs) and gated recurrent units.

B. Pseudo code

- MAIN PROGRAM

  BEGIN
  INPUT ticker
  If(ticker is valid) THEN
  GET THE DATA FROM YAHOO FINANCE
  TRAIN THE NETWORK
  TEST THE NETWORK
  GET THE FORECAST FOR 30 DAYS
  PASS THE DATA TO UI
  CREATE A TABLE ON THE UI
  CONFIGURE TABLE TO DISPLAY FORECASTED VALUES
  DISPLAY THE UI
  ELSE
  DISPLAY("TICKER IS NOT VALID")
  END

- FORWARD PASS

  1. SET UP PARAMETERS:
  UNIT CELLS, CELL STATES, ACTIVATION FUNCTIONS
  2. ACTIVATE INPUT CELLS
  3. ACTIVATE OUTPUT CELLS
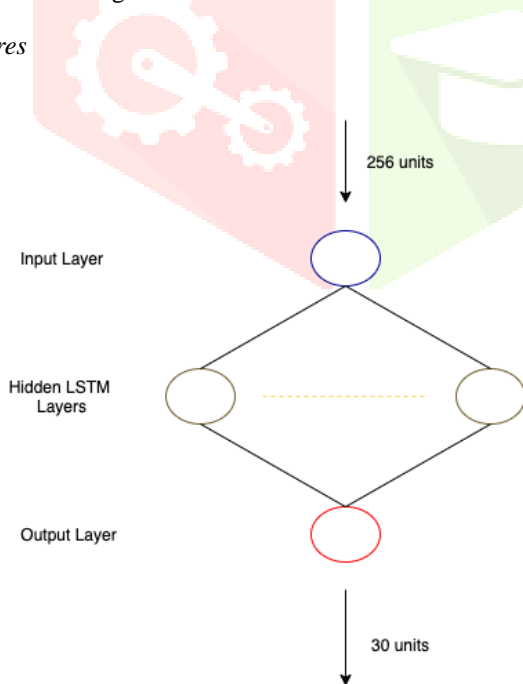 4. USE PARTIAL DERIVATIVE FOR ACTIVATION OF CELLS TRAINING THE NETWORK

5. END LOOP OVER CELLS MEMORY CELLS

- BACKWARD PASS
  1. ERROR CALCULATION
  2. UPDATE WEIGHTS
  3. END LOOP OVER

C. Execution

- The Neural Network has 1 input layer with 256 units, 2 hidden LSTM layers, 1 output layer with 30 units.
- Parameters.py : This module operates on Tensorflow. Its sets the parameters for the neural networks. All the parameters which are to be defines fro designing the neural network are defined here.
- Stock Prediction.py :This module is creating/loading the data required from Yahoo finance. The data from Yahoo finance is raw and needs to be processed. All this data processing is done so that we have data in a relevant format to create a model, train it and then perform testing on it effectively. This is done by the load data() function.The create model function creates an LSTM Neural Network and constructs the neurons as specified in the Parameters file.This module is also responsible for splitting the data obtained from Yahoo Finance into training and testing.
- Train.py : The model created in stock prediction.py is put for training in this module. The 'fit' function is applied to the created module. The data on which the module is trained is obtained for the load data function in stock prediction.py.
- Test.py: Once the model has been created it is tested for obtaining the efficiency of the system. The predict() is used for testing the model

D. Figures

256 units

Input Layer

Hidden LSTM Layers

Output Layer

30 units

E. Data Sets

The Dataset used for the purpose of classification is the live data obtained from Yahoo Finance. Yahoo Finance stores the data for the NYSE stock market from 1970 and has made it available for python developers through a python API named yahoo fin. This is obtained as a dataframe in Python which can be accessed as per the requirements of the system.

V. RESULTS

After running the test.py file this is the basic GUI window that is displayed. This screen is built solely using tkinter library. After that the user can enter the ticker name (Company abbreviation as listed on the NYSE market) which they desire to find the predicted stock for. Thereafter the stock price for 7 days on from the current date will be displayed). This can be used for multiple companies as long as they are listed on the NYSE market. The input is not case sensitive.

Date	Price	Ticker
2020-05-07	8.329999923706056	APLE
2020-05-08	8.72000026702881	APLE
2020-05-09	9.020000457763674	APLE
2020-05-10	9.680000305175783	APLE
2020-05-11	10.239999771118166	APLE
2020-05-12	9.390000343322756	APLE
2020-05-13	8.659999847412111	APLE

VI. FUTURE SCOPE AND APPLICATIONS

A. Future Scope

1. We can use the similar model for different market such as NSE and BSE
2. Creating a Web based GUI

B. Applications

- Analysing received Stock Data: This application facilitates the analysis of large data fed into the system and processes them to predict the next few days.
- Predicting Future Data: The task of predicting future stock is a tricky one. It is not easy to accurately predict the state of the market at a given time. We believe that with our algorithm, you can make a sound investment into the market.
- Provide an open platform to developers: The summarized text is read out for people who have difficulty with vision. This will be extremely helpful to the differently abled. They can scan newspaper articles and receive daily.

CONCLUSION

In conclusion, with this system, we intend to train a model which can successfully analyse a set of data given to it and predict the future scope of the market. It will give students getting into the market easy access to a platform for discussions and resources. With it's open source nature of our project, it gives other developers the opportunity to improvise on our code and mold it according to what as they see necessary.

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