Stock Market Value Prediction

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***Abstract*— Prediction and analysis of stock market data have got an important role in today's economy. One choice in Stock Market can have gigantic effect on an investor's life. The stock market is a tricky system and often covered in secrets, it is therefore, very difficult to study all the influencing factors before making a decision. The effective prediction of a stock's future cost will increase investor's profits. Machine learning and deep learning have been used in stock market prediction during the last decade. This strategy of price prediction of stock for future purpose and their status on company sources can be done using Forecasting Technique like SMA, SES, Holt-Winter and ARIMA and Deep Learning Architecture like RNN and LSTM, which all together give the user the forecast of every stock price queried by him. The proposed system will be vital help for building the stock price of every particular company, who need to know the status of its stocks in future. Data will go through all the forecasting techniques and deep learning architecture then it will choose the approximate accurate model for prediction.**

Keywords — Recurrent Neural Network component, Long-Short Term Memory, Simple Moving Average, Simple Exponential Smoothening, Holt-Winters Method, Autoregressive Integration Moving Average.

I. INTRODUCTION

Our thesis is based on stock market prediction. This is a difficult task because market behaviour is stochastic, volatile and influenced by many factors such as global economy, politics, investor expectation and others. Stock market is the vital piece of economy of the country and plays a valuable role in the growth of the industry and commerce of the country that in the end affects the economy of the country. Advances in artificial intelligence and the growth of available data have made it possible to forecast the stock price behaviour with better performance than a random process.

We are going to use Deep Learning algorithms and Forecasting Techniques to predict the stock market. There is a misconception about the stock market i.e. buying and selling of stocks is an act of betting. So this misconception can be changed and bringing the awareness across the people for this. The prediction techniques in stock market can plays a crucial role in bringing more people and existing investors at one place. The more promising results of the prediction methods can be change the mind-set of the people.

II. METHODOLOGY

We are using Deep learning algorithms like recurrent neural network (RNN) & Time series forecasting methods such as Simple Moving Average (SMA), Simple Exponential Smoothening, Holt-Winters Method and ARIMA.

With using these algorithms and forecasting techniques, we will be able to predict the stock prices.

The Raw data will be collected from the Yahoo Finance. Then the collected data will be pre-processed so that there may not be any redundant data, or anomalies in the data. The prepared data then goes to learning algorithm in which the data is trained and the deep learning architecture and time forecasting techniques are applied to the data and then error test is run on it.

It will go on iterating unless and until it gets the approximate predicting model. Once the model it gets the approximate predicted model it deploys the model. Finally the chosen model is used for prediction.

Prediction architecture are as follows.

A. Deep Learning Architecture

- Recurrent Neural Network (RNN) :

RNNs are called recurrent because they perform the same task for every module of a sequence, with the output being depended on the past calculation.

Because of their internal memory, RNN's are able to remember important things about the input they received, which enables them to be very precise in predicting what's coming next.

Recurrent Neural Network has double data sources, the present and the recent past.

- Long-Short Term Memory (LSTM):

LSTM is a recurrent neural network (RNN) architecture that recollects values over random intervals.

LSTM networks handle this by learning when to remember and when to overlook.

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LSTM were introduced by and it aimed for a better performance by tackling the vanishing gradient issue that recurrent networks would suffer when dealing with long data sequences. It does as such by keeping the error flow consistent through special units called ”gates” which allows for weights adjustments as well as pruning of the gradient when its information is not mandatory.

B. Time Series Forecasting

- Simple Moving Average (SMA) :

A simple moving average (SMA) is the least complex type of technique of forecasting.

Moving averages can be utilized to rapidly recognize whether selling is moving in an uptrend or a downtrend relying on the pattern captured by the moving average.

- Simple Exponential Smoothing (SES)

Exponential smoothing is normally a method for “smoothing” out the data by pruning much of the “noise” (random effect) from the data by giving a better forecast.

Latest or recent observation are given more weight in forecasting then past observation. We can utilize this for forecasting a series that doesn’t have trend and doesn’t have seasonality.

- Autoregressive Integration Moving Average (ARIMA) :

ARIMA stands for Autoregressive Integrated Moving Average. ARIMA is mainly used to predict future values using historical time series data.

It works best when your data shows a steady or consistent pattern over time.

- Holt-Winters Method

The three part of the time series behaviour— value, trend, and seasonality are stated as three kinds of exponential smoothing, so Holt-Winters is called triple exponential smoothing. Holt-Winters technique is an exponential smoothing approach for managing seasonal data.

C. Equations

- Simple Moving Average (SMA) :

  Equation for Simple Moving Average

  $Ft = (1/N) (Dt - 1 + Dt - 2 + \ldots + Dt - n)$

- Simple Exponential Smoothing (SES):

  Equation for Simple Exponential Smoothing

  $Ft+1 = \alpha D_t + (1 - \alpha)F_t$

  Where $0<\alpha< 1$

  New Forecast = α (most recent observation) + (1-α) (last forecast)

- Autoregressive Integration Moving Average (ARIMA) :

  Equation for ARIMA

  $X(t) = A(1) * X(t-1) + A(2) * X(t-2) + E(t)$

  X(t) =current variable

  A(1) = the autoregressive parameter of order 1

  X(t-1) = the time series lagged 1 period

- Holt-Winters Method:

  Equation for Holt-Winters Method

  Overall Smoothing equation $St = \alpha\, y_t/I_{t-L} + (1-\alpha)(S_{t-1} + b_{t-1})$

  Trend Smoothing equation $bt = \gamma (S_t - S_{t-1}) + (1-\gamma)b_{t-1}$

  Seasonal Smoothing equation $I_t = \beta\, (y_t / S_t) + (1-\beta)I_{t-L}$

  Forecasting equation $F_{t+m} = (St + mb_t)\, I_{t-L+m}$

  Where

  y = Observation

  S = Smoothed observation

  b = Trend factor

  F = Forecast at m periods ahead

  T = An index denoting a time period

  L = Seasonal Periods

  α, β, γ = Alpha Beta and Gamma are constant

III. RESULT

Predictions	Root Mean Square Error
Simple Moving Average	0.459
Simple Exponential Smoothing	0.502
Holt Winters Method	0.449
ARIMA	0.389
Recurrent Neural Networks	0.0158
LSTM	0.0159

For stock prediction models, we try to solve the following problem: given a processed list of features, we would like to forecast its potential future price variations. Simple Moving Average method is a natural choice of baseline model for forecasting problems. So we first ran SMA including all features. The model is then used to forecast future prices of stocks given features in our test data and is compared to the actual stock prices given in test data set.

The execution was estimated by Root Mean Square Error (RMSE) of the predicted outcomes and the actual outcomes. Our baseline model generated a RMSE of 0.459.

After using Simple Moving Average model as the baseline model, we implemented Simple Exponential Smoothing. SES generated a RMSE of 0.502, which is greater than our baseline model.

The two Holt’s methods namely Holt’s Linear Method and Holt Winter’s method generated an RMSE of 0.137 and 0.449 respectively.

We then fitted our training dataset with ARIMA model. The Autoregressive Integrated Moving average model generated a RMSE of 0.3899, which is also better than our baseline model.

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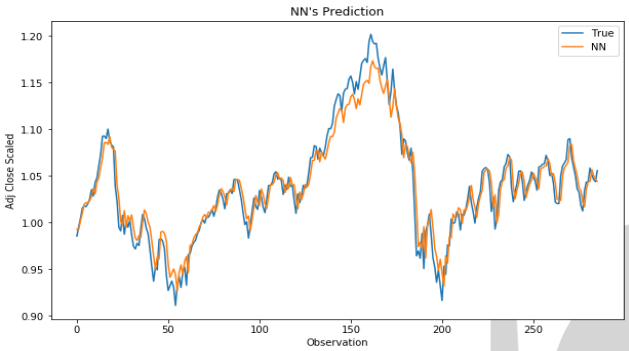
We further implemented two deep learning models: Recurrent Neural Networks and Long Short Term Memory. These models gave respective RMSE scores of 0.0159 and 0.0158 respectively.

Overall, all of the models performed better than the basic model. Specifically, RNN performed the best among all models, which generated the lowest RMSE of 0.0158. We suggest that this prediction model be used for stock price predictions.

IV. IMPLEMENTED SYSTEM

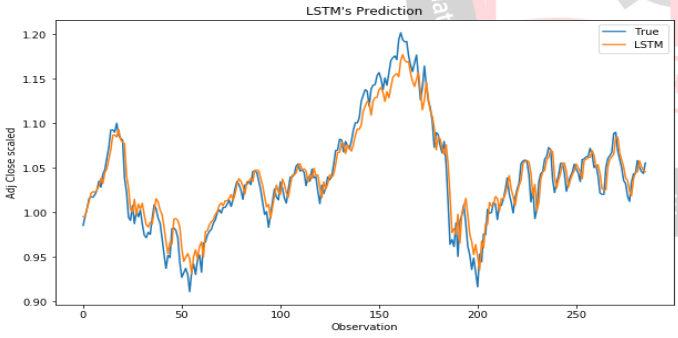
Output Visualization Results of Selected Best Models:

1. Recurrent Neural Networks



According to the result table above RNN give optimal and approximate prediction then others. It stand first in the score table that is, nearer to the actual data provided. The Root Mean Square Error for RNN is 0.0158 which is nearest to the imported data.

2. LSTM



LSTM is the second highest prediction result in the score data. Its Root Mean Square Error is 0.0158 which is nearer to the actual imported data.

3. ARIMA

ARIMA is the highest achieving prediction among the forecasting technique. It give approximate result but not as optimum as deep learning architectures. The Root Mean Square Error for ARIMA is 0.0158 which is more as compared to deep learning architectures but less if compared with other forecasting technique.

V. CONCLUSION

The system helps every company user who is in dilemma whether the particular stock of his will have what status in future. So that he can invest on the upcoming stock. The forecasting technique like RNN, LSTM and ARIMA works best when it comes for stock prediction. It observed that, deep neural network architectures are capable of capturing hidden elements and are able to make predictions. Our project's goal is to identify the most suitable method or model based on deep learning and forecasting technique for better prediction.

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