Stock prediction using LSTM

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Abstract

When it comes to investing in the stock market, individuals are usually seeking for an accurate and effective method of guidance. Even if it has never been easy to invest, the financial market anomaly does not allow for simple models to anticipate future asset values with more precision. The LSTM (Long Short-Term Memory) network is the most common model for RNN (Recurrent Neural Network) right now, which is used for deep learning since it can train very huge architectures.. Stochastic gradient descent (SGD) is used to alter the weights of individual data points in the proposed Long Short-Term Memory (LSTM) method, which will yield more accurate results.

1. Introduction

1.1. Project Description

The stock market offers a platform for individuals and institutions to purchase and sell securities, such as common stock in publicly listed companies and preferred stock in privately held companies. Many individuals put their money into investments in the hopes of making a profit since it is such a large platform for investment.1 It's becoming more and more common for people to invest money in the stock market, and they're seeking a simple and reliable method of predicting stock prices. Building an efficient prediction system that can assist investors to make the appropriate investment choice is the target of this research.

1.2. Current scenario

In recent times, the stock market has become a common venue for the global exchange of massive amounts of wealth.

The stock market has a profound effect on people's lives and economic standing around the world. Due to the lack of an efficient prediction system, traders are unable to sell their stock prior to its value declining or to purchase it prior to its price increasing, which is a significant issue. The higher the rate of return on an investment in the stock market, the greater the chance of losing money. Investors must do research and investing analysis in order to identify potentially lucrative stocks, which is a time-consuming process.

2. Literature Review

Analysts had used a variety of methods and approaches to try to anticipate the future value of the stock market. For example, there are publications like 'Stock Market Forecasting Using Machine Learning Algorithm(3), 'Stock Market Returns using ANN and Genetic Algorithm(4), Stock Market Prediction using Hybrid Approach, 'Stock Market Prices do not Follow Random Walks'5 Individuals have sought to use and give strategies for predicting stock market values in these studies and related research. It's possible that some researchers and business people have tried to study several approaches for stock market prediction in order to decide on the ones that are most practical for their specific purposes. For stock movement predictions, we found that the shortterm VMA guidelines worked better. In the end, these kinds of initiatives allow investors to use the ideas presented to better their investing strategy. Technical study of stock charts is critical

when investing in equities. If a stock's future price can be accurately predicted, investors can make large money by deciding whether to purchase, hold, or sell the stock.(Ercan 2017)

3. Methodology

3.1. Selected Algorithms

The Long Short-Term Memory (LSTM) network is a sort of recurrent neural network that is frequently used for solving sequence prediction issues and has been shown to be exceptionally successful. The LSTM algorithm processes data by propagating bits of information forward. The LSTM architecture was established from an analysis of the error in recurrent neural networks (RNNs). It is divided into cells, and the actions performed within each cell are distinct from one another which are used to keep or forget the information 6. The LSTM cell serves as a transportation highway, transporting information down the sequence chain. LSTM networks are composed of three layers: an input layer, a hidden layer, and an output layer. The buried layer is made up of memory cells and their associated gate units. This includes lengthy time lapses that are not available during backpropagation. Similarly, the LSTM layers consist of a collection of memory blocks that are connected in a recurrent manner. LSTMs are capable of solving a wide variety of jobs that RNNs cannot. The reason they operate so effectively is that LSTMs can remember significant information from the past while forgetting irrelevant information7.

- The input gate: The input gate adds information to the cell state

- The forget gate: It removes the information that is no longer required by the model.The forget gate is responsible for deciding what information to be removed or kept

- The output gate: Output Gate at LSTM selects the information to be shown as output

Each unit is like a mini-state machine where the gates of the unit have weights that are learned during the training procedure.8

3.2. library used in project

- Sklearn : Scikit-learn is an open-source library for machine learning that supports both supervised and unsupervised learning. Additionally, it has several built-in algorithms for model fitting, data preparation, model selection, and assessment.9

- Keras : Keras is open-source software that offers multiple implementations of frequently used neural-network building components including layers, activation functions, and optimizers, as well as tools to make text data easier to simplify the coding necessary for writing deep network code.10

- Matplotlib : Matplotlib is a Python package that enables the creation of static, animated, and interactive visualizations.11

- TensorFlow : TensorFlow is a free and open-source machine learning and artificial intelligence software library. It is applicable to a wide variety of applications but is particularly well-suited for training and inference of deep neural networks.12

3.3. Data Collection and Preparation

Data of TSLA is collected from the yahoo finance (https://finance.yahoo.com) which includes information like Open price, close price, maximum price, minimum price over different series of years. The close price is taken into the consideration using the filter function.

3.4. Preparing training and test data

Here, the goal is to forecast the next day's stock price utilizing all available historical data. Historical data is used to train the Recurrent Neural Net model. In this case, a forecast for the following day is based on previous data. The algorithm is only useful for daily trading because it only forecasts the price for one day in the future. The study calculates the Normalized Root Mean Square Error of TSLA dataset . It is common to utilise the root-mean-square error (RMSE) (or rootmean-squared error) as a measure of the variances between projected values and actual values.

Comparing datasets or models of various scales is easier if the RMSD is normalized. The mean or the range (defined as the highest value minus the smallest value) of the measured data are frequent alternatives for normalization:

Formula used to calculate RMSE:

Actual vs projected values vs valid value

pandas datareader. The number of iterations was

$$RMSE = \sqrt{MSE(y_{predicted}, y_{test})} \quad (1)$$

Mathematically, MSE stands for Mean Squared Error (MSE). It is the average squared difference between the estimated values and what is actually estimated that is used to calculate an estimator's MSE (measuring standard error of an estimation technique for an unobserved quantity). Randomness or a lack of consideration for information that may lead to a more precise estimate are two possibilities for why MSE is almost always strictly positive (rather than zero). Estimator quality may be measured using MSE, which is always non-negative and values near to zero are considered preferable.

Formula used to calculate NRMSE :

$$NRMSE = \frac{RMSE}{max(y_{predicted}) - min(y_{predicted})} \quad (2)$$

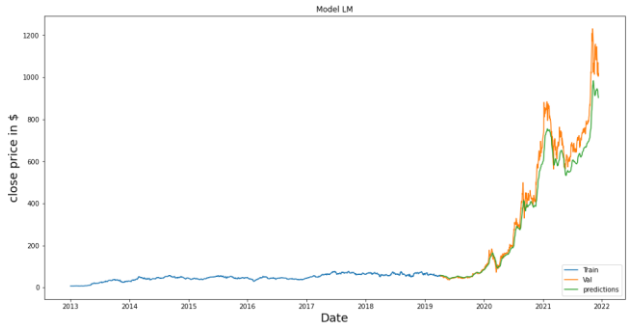
Normalized root mean square deviation (NRMSD) or error (NRMSE) is a typical term for this measurement; lower values imply lesser residual variance("Stock Price Prediction Of Nepal Using LSTM" 2018).

4. Analysis

The graph represents the actual vs projected values of TSLA. Additionally, the TSLA's predicted opening value for the next day is indicated. The training and testing datasets are divided in a 7:3 ratio. The model's accuracy is estimated to be approximately 85 percent.

batch size argument. The rate of learning has been set at

0.002. Decreased learning rate resulted in each iteration was taking longer to complete, i.e. convergence became extremely low; this resulted in the training set becoming overfit, resulting in lower accuracy. It was



5. Result

The TSLA dataset was taken from Yahoo finance using the

calculated using the get next batch method, which accepts a

7. Acknowledgement

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incoming set. By increasing the number of LSTM layers, the accuracy was maintained at the level of two layers, but the training time was increased. After assessing the output value, the root mean square error (RMSE) was calculated to be 0.156, indicating that the majority of anticipated values are correct. The network took 45 seconds to train and test on an Inspiron 5567 running Windows 10, with an Intel(R) core i7-75000 CPU running at 2.70GHz (4 CPUs), and 8192MB RAM.

6. Conclusion

Based on Yahoo Finance's TESLA stock, LSTM was used to predict the stock's value. Despite the fact that a variety of approaches exist to do similar prediction tasks, developments in deep learning have made LSTMs useful networks. Accurate stock market predictions are possible thanks to well-implemented LSTM. In this study, the LSTM model was built using two LSTM layers, input and output layers. The stock price of TSLA is predicted and a graph showing the real vs. predicted value is shown. I'd say the results were fairly promising. Furthermore, boosting the dataset can improve the system's accuracy.

References

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