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Stock Market Prediction Using Deep Learning

Aditya Rana[1], Rutvik Kachchhi[2], Jay Bharadia[3], Prof. Vishakha Shelke[4]

[1,2,3]*UG Student, Dept. of Computer Engineering, Universal College of Engineering, Mumbai, India*
[4]*Assistant Professor, Dept. Of Computer Engineering, Universal College of Engineering, Mumbai, India*

Abstract - *Stock Market data has been used by many people to extract the profit from the market. Due to rise in technology and artificial intelligence, it has become easy to do analysis and predict the future prices based on the past performance of the given stock. Market prediction is in the forefront of development of deep learning algorithms. With the advancement in neural networks, there are different ways to predict the stock price. Artificial intelligence techniques are being used in conjunction with data mining to solve a real-world problem. Deep learning algorithm has increased the profits of countless people in the past few years. We are going to use deep learning model to predict the price of the stock. We propose a system that uses stacked LSTM model to predict the future prices. Our main aim is to see how this simple implementation will bring acceptable results.*

Key Words: **Deep learning, Recurrent neural network, Convolutional neural network, Long Short-Term Memory, Stocks forecasting.**

1. INTRODUCTION

The stock exchange is thought for its volatility, randomness, and unpredictability. It is a chaotic place with an improbably large endlessly dynamic stream of information that makes predicting and functioning on those predictions to form a profit terribly arduous. it's truly one in all the most difficult tasks in times series prediction. This capstone's main goal is to check and apply deep learning techniques to the stock market so as to predict stock behavior and therefore act on those predictions to avoid investment risk and generate profit. The goal is to be achieved by Deep learning so as to require advantage of pre-built neural networks models. Predictions square measure then tested against actual historical stock value knowledge. In order to try to therefore, several tools are going to be accustomed accurately reach the objectives of this project. As for the model and languages to be used, when an intensive research the programming language to be used for implementation is going to be Python, this can be due to its flexibility and therefore the availableness of pre-built models and opensource notably helpful libraries which will facilitate us with our goal and perhaps even enhance results. In addition, this paper can be a straightforward example of the foremost fitting model (the one that yields the most effective results) within the case of your time series prediction that is definitely the LSTM model that stands for Long Short-Term Memory. Compared to a standard deep neural network, its effectiveness is because of the addition of a vital part in statistic predictions, the memory part. Moreover, this report will have a lot of advanced example of LSTM models, concerning the targeted stocks.

2. LITERATURE REVIEW

[1] Mustain Billah, Sajjad Waheed, Abu Hanifa, they examined that Predicting closing stock worth accurately may be a difficult task. Computational power-assisted systems are established to be a useful tool for stock prediction like Artificial Neural Network (ANN), adaptational Neuro Fuzzy abstract thought System (ANFIS) etc. Latest analysis works prove that adaptational Neuro Fuzzy abstract thought System shows higher results than Neural Network for stock prediction. During this paper, Associate in Nursing improved Levenberg Marquardt (LM) coaching algorithmic rule of artificial neural networks has been planned. Improved Levenberg Marquardt algorithmic rule of neural networks will predict the doable day-end closing stock worth with less memory and time required, provided previous historical securities market knowledge like gap worth, highest worth, lowest worth, total share listed. Moreover, Associate in Nursing improved lumen algorithmic rules will predict day-end stock worth fifty-three less error than ANFIS and ancient lumen algorithms. It conjointly needs half-hour less time, fifty-four less memory than ancient lumen and forty seventh less time, fifty-nine less memory than ANFIS.

[2] Abidatul Izzah, Yuita Arum Sari, Ratna Widyastuti, Toga Aldila Cinderatama, in this work, Stock Prediction is developed in each of 2 studies, economics, and data processing. Stock predictions got special attention because of its importance for making a more practical and economical designing. During this study, Improved Multiple regression (IMLR) was designed into a mobile application primarily based humanoid platform for stock worth prediction. IMLR may be a hybrid Multiple regression with Moving Average technique. The app was in-built many steps, that area unit demand analysis, system style, implementation, and testing. Knowledge was collected from the finance.yahoo.com page with class "Jakarta Composite Index (JKSE)"that was mechanically taken by victimization Yahoo Finance API. during this app, users not solely may see daily stock history however conjointly stock worth predictions in real time.

[3] R. Yamini Nivetha, Dr. C. Dhaya, presents that prediction within the securities market is difficult and sophisticated for investors. several researches have performed to sense the longer-term market movements. within the securities market, social media knowledge incorporates a higher impact these days than ever. During this work, varied prediction algorithms are analyzed to create a prediction model. The prediction model supports monthly prediction and daily prediction to forecast future day value. This model estimates the worth of the future day within the market. Sentiment Analysis has to establish and extract sentiments from every individual within the social media. The correlation between the feelings and therefore the stock price is to be determined. A comparative study of those 3 algorithms: Multiple regression, Support Vector Machine and Artificial Neural Network area unit done. The stock worth is foretold by sentiment analysis with the simplest foretelling algorithmic rule.

[4] Hardik Parekh, Aditya Menon, Shivali Singh, the review of papers helped us understand the different types of models available on the topic. We ventured further to find if there were ways to predict movement using financial news and people's opinions and found further studies. The deep learning models had similar models, the differences being the method of deep learning used, whether FF, RNN or LSTM. So, we can represent the overall deep learning mode from the review, an interesting observation came from the prediction using forums. The model, when run with only text processing gave moderately accurate results. But when used in conjunction with LSTM, the model accuracy vastly increased. Predicting with financial news however, resulted in a higher accuracy than using a neural network with OHLC parameters. After reviewing the frameworks available for our topic, we can conclude by saying that the deep learning models by itself, though show promise, can be made more accurate by using them in conjunction with a text-based processing algorithm. We would recommend choosing financial news as the source rather than a forum since financial news is more factual and has a higher degree of accuracy. Our future work would include researching more on the topic of LSTM model for forecasting and financial news as a source in conjunction with stock market data and highly specialized prediction algorithms the analysts use. Possibly try and implement the same using python at a small scale.

[5] Tejas Mankar, Tushar Hotchandani, Manish Madhwani, Based on the comparative study performed, the challenges addressed are Historical Twitter data cannot be obtained, unless it is saved by someone, so data has to be collected over a duration of a fixed number of months starting from the present date and time; It is necessary to filter out required data from the stream of unrelated tweets and Authentication is required for accessing real time Twitter data. Support Vector Machine proved to be the most efficient and feasible model in predicting the stock price movement, in favour of the sentiments of the tweets. Cloud services will enable us to collect large amounts of data and also store it in real time when we will get the data directly from the REST API.

3. METHODOLOGY

In the Major project, deep learning algorithm and libraries to perform prediction of the particular given stock. In our methodology we have used two main libraries i.e. Keras and TensorFlow. The methodology of the major project is divided into five steps. They are as follows:

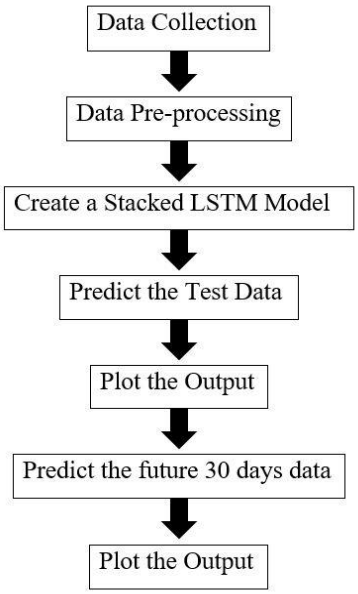

Fig -1: Data flow diagram

The first step will be collecting the stock data e.g. AAPL i.e. Apple stocks. So we will be using many different types of library in our methodology such as pandas-datareader which is a remote data access to extract data from various internet sources into pandas dataframe and for the reading the data, Tiingo is a financial data platform that makes high quality financial tools available to all and it has a REST and Real-Time Data API with this library it helps us to access the data, NumPy is used for working with arrays and it also has functions for working in domain of linear algebra, fourier transform, and matrices, Matplotlib which is used to plot on map of stock prices, sklearn is the most useful and robust library for deep learning. For this program, LSTM are sensitive to the scale of the data so we apply MinMax scaler to convert the data to 0 and 1.
The second step will be pre-processing the data so will train the data and then test it. By using the LSTM method, we will be splitting the dataset into train and test split. The data will be split into timesteps so the test part we will take x_train and y_train and so the train part we will take y_train and y_test. After doing this, we have to reshape our x_train into 3 dimensions which is required for LSTM.

The third step will be to create a stacked LSTM model. A Stacked LSTM is an architecture that can be defined as multiple LSTM layers. LSTM gives sequential output rather than single value output.

The fourth step is to predict the test data and plot the output. so first we will check the performance metrics and then transform back to original form. Then we will calculate RMSE (Root mean square error) performance metrics and test the data RMSE. After doing the test data we will plotting the output in that we have to shift the train & test predictions for plotting. Test data of predicted output shows that it is basically a green colour line output. Blue colour line output shows it is a complete dataset. Training dataset is how the prediction is gone shows that it is basically orange colour output. We have also used scaler inverse transform; it will transform the data such that its distribution will have a mean value 0 and standard deviation of 1.

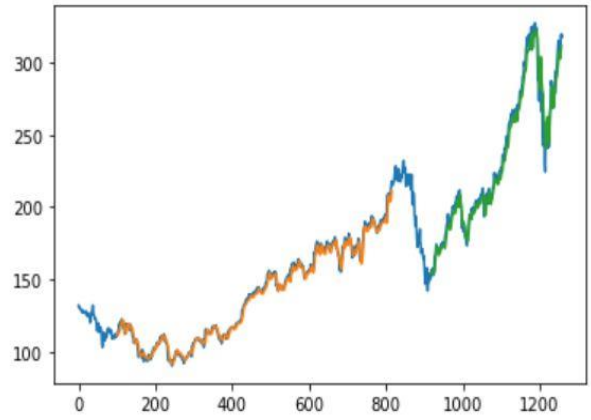

Chart -1: Predicted Output for train and test data

The fifth step is to predict the future 30 days and again plot the output. So basically, we will take 100 days data before to predict 101th data i.e. next to 30 days. Test data will be taken from 1 to 101 (i.e. 100 indexes) and predicting the data will be taken from 101 to 131 (i.e. 30 days). After doing that we will be getting a new 30 days output which is orange line colour.

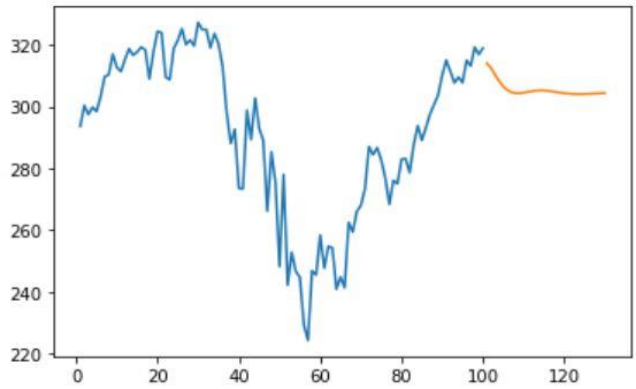

Chart -2: Predicted Output for test data

4. CONCLUSION

The deep learning models by itself shows more accurate by using them in deep learning algorithm. We would recommend choosing Kaggle as the source rather than a forum since Kaggle is more factual and has a higher degree of accuracy of the datasets. Our future work would include researching more on the topic of LSTM model for forecasting as a source in conjunction with stock market data and highly specialized prediction algorithms the analysts use. Possibly try and implement the same using python at a small scale.

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