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Stock Price Prediction Using Machine Learning Techniques

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ABSTRACT: The stock market has always been attracting people with its high returns but with it comes challenges and risks. A stock exchange market depicts savings and investments that are advantageous to increase the effectiveness of the national economy. The future stock returns have some predictive relationships with the publicly available information of present and historical stock market indices. FB PROPHET is a statistical model which is known to be efficient for time series forecasting especially for short-term prediction. In this project, we propose a model for forecasting the stock market trends based on the technical analysis using historical stock market data and FB PROPHET model. This model will automate the process of predicting the direction of future stock price indices, thereby, helping the financial specialists choose better timing for purchasing and/or selling of stocks. The results are shown in terms of web-application as frontend and using Python programming language. The obtained results reveal that the FB PROPHET model has a strong potential for short-term prediction of stock market trends.

KEYWORDS: FB Prophet, LSTM, python

I. INTRODUCTION

Machine learning (ML) is the study of computer algorithms that improve automatically through experience and by the use of data.^[1] It is seen as a part of artificial intelligence. Machine learning algorithms build a model based on sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to do so.^[2] Machine learning algorithms are used in a wide variety of applications, such as email filtering and computer vision, where it is difficult or unfeasible to develop conventional algorithms to perform the needed tasks.

A subset of machine learning is closely related to computational statistics, which focuses on making predictions using computers; but not all machine learning is statistical learning. The study of mathematical optimization delivers methods, theory and application domains to the field of machine learning. Data mining is a related field of study, focusing on exploratory data analysis through unsupervised learning.^{[4][5]} In its application across business problems, machine learning is also referred to as predictive analytics.

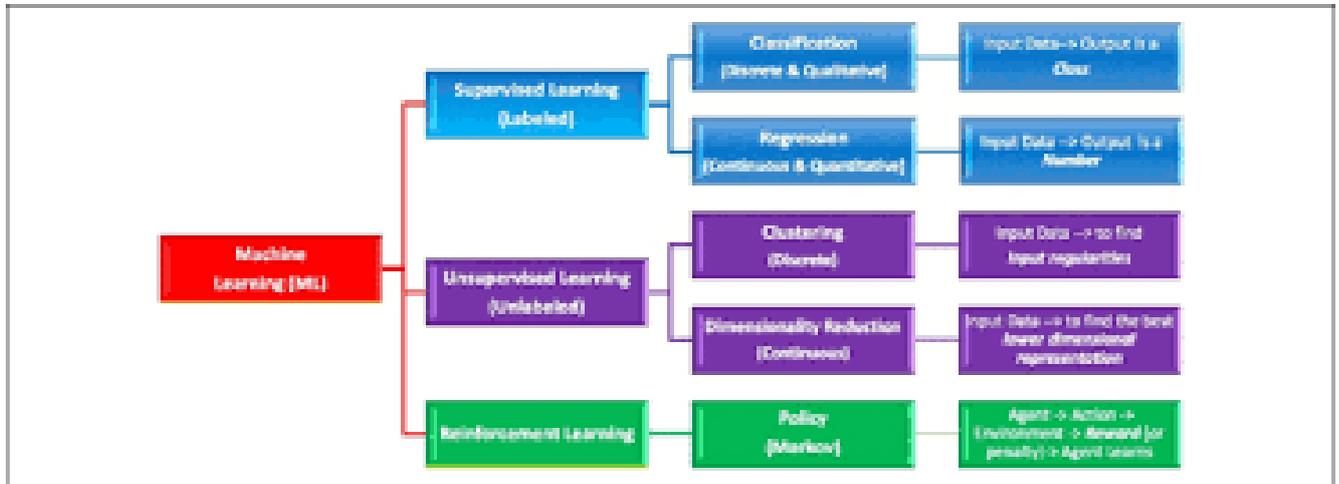


Figure 1 – Architecture Diagram of Machine Learning

LITERATURE SURVEY

In the year 2014, Jigar Patel, Sahil Shah, Priyank Thakkar, K Kotecha proposed the paper addresses problem of predicting direction of movement of stock and stock price index for Indian stock markets. The study compares four prediction models, Artificial Neural Network (ANN), Support Vector Machine (SVM), random forest and naive-Bays with two approaches for input to these models. The first approach for input data involves computation of ten technical parameters using stock trading data (open, high, low & close prices) while the second approach focuses on representing these technical parameters as trend deterministic data. Accuracy of each of the prediction models for each of the two input approaches is evaluated. Evaluation is carried out on 10 years of historical data from 2003 to 2012 of two stocks namely Reliance Industries and Infosys Ltd. and two stock price indices CNX Nifty and S&P Bombay Stock Exchange (BSE) Sense. The experimental results suggest that for the first approach of input data where ten technical parameters are represented as continuous values, random forest outperforms other three prediction models on overall performance. Experimental results also show that the performance of all the prediction models improves when these technical parameters are represented as trend deterministic data.

In another study in 2013, Yanshan Wang proposed the prediction of a stock market direction may serve as an early recommendation system for short-term investors and as an early financial distress warning system for long-term shareholders. In this paper, we propose an empirical study on the Korean and Hong Kong stock market with an integrated machine learning framework that employs Principal Component Analysis (PCA) and Support Vector Machine (SVM). To predict the upward or downward direction of stock market index and stock price. In the proposed framework, PCA, as a feature selection method, identifies principal components in the stock market movement and SVM, as a classifier for future stock market movement, processes them along with other economic factors in training and forecasting. We present the result so fan extensive empirical study of the proposed method on the Korean composites to ck price index (KOSPI) and Hang Seng index (HSI), as well as the individual constituents included in the indices. In our experiment, ten years data (from January 1st, 2002 to January 1st, 2012) are collected and schemed by rolling windows to predict one-day-ahead directions. The results also imply the co-movement effect between the Korean (Hong Kong) stock market and the American stock market.

In year 2012,Shunrong Shen, Haomiao Jiang, Tongda Zhang gave theprediction of stock market is a long-time attractive topic to researchers from different fields. In particular, numerous studies have been conducted to predict the movement of stock market using machine learning algorithms such as support vector machine (SVM) and reinforcement learning. In this project, we propose a new prediction algorithm that exploits the temporal correlation among global stock markets and various financial products to predict the next-day stock trend with the aid of SVM. Numerical results indicate a prediction accuracy of 74.4% in NASDAQ, 76% in S&P500 and 77.6% in DJIA. The same algorithm is also applied with different regression algorithms to trace the actual increment in the markets. Finally, a



simple trading model is established to study the performance of the proposed prediction algorithm against other benchmarks.

In the year 2009, Tsai, C.-F. and Wang, S.-P suggest stock investment has become an important investment activity in Taiwan. However, investors usually get loss because of unclear investment objective and blind investment. Therefore, to create a good investment decision support system to assist investors in making good decisions has become an important research problem. Artificial Neural Networks (ANN) can provide relatively good performances in forecasting stock price but it cannot explain the forecasting rules clearly. On the other hand, a decision tree (DT) model can generate some rules to describe the forecasting decisions. This paper focuses on combining ANN and decision trees to create a stock price forecasting model. The experimental result shows that the combined DT+ANN model has 77% accuracy, which is higher than the single ANN and DT models over the electronic industry.

III. PROPOSED METHODOLOGY AND DISCUSSION

Existing System

One of the significant financial subjects that has engrossed the researcher's attention for many years is forecasting the stock returns. Investors in the stock market have been attempting to discover an answer to estimate the stock trends to decide the better timing to buy or sell or hold a share. Forecasting the stock trends have been done both on qualitative analysis and quantitative analysis. There are many statistical models available for forecasting stock trends and choosing an appropriate model for a forecasting application depends on the format of the data

Proposed System

In this work we propose a prediction model for the time series stock market data. This model will automate the process of change of stock price indices based on technical analysis and helps with financial specialists to choose the better timing for purchasing and selling stocks. Data mining techniques are used to develop the prediction model and Python programming language is used for visualization of results.

Data Collection

Once the understanding of the objective is over, the next step is to collect the data. Data collection involves the understanding of initial observations of the data to identify the useful subsets from hypotheses of the hidden information. Here we use Python script to collect the data from Yahoo finance.

Pre-processing

The data pre-processing stage involves all the activities to prepare the final dataset from the preparatory raw information. The data preparation tasks can be performed several times as there is no specific order. These tasks include the selection of a record, table, attribute and cleaning of data for modeling tools.

Data training

In technical analysis investors use the auto regressive and moving average models to forecast the stock trends. Major steps involved here are identification, parameter estimation and forecasting.

Forecasting Results

The process of making predictions of the future by relying upon the past and present data is known as forecasting. Various prediction techniques are used by the stock analysts to evaluate the future stock trends value. Prediction also offers a significant standard for organizations that have a long-term perception of actions.

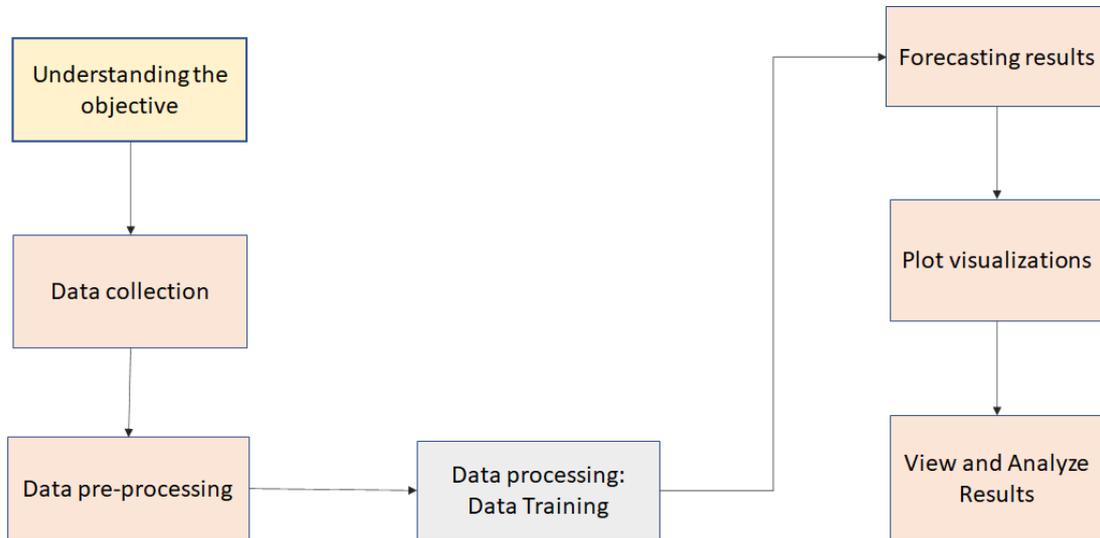


Figure 2 – Working of proposed model

IV. EXPERIMENTAL RESULTS

Figures shows the results of predicting the stock price by using the machine learning techniques based on CNN and LSTM algorithm



Figure 3 – Graph obtained by the algorithm

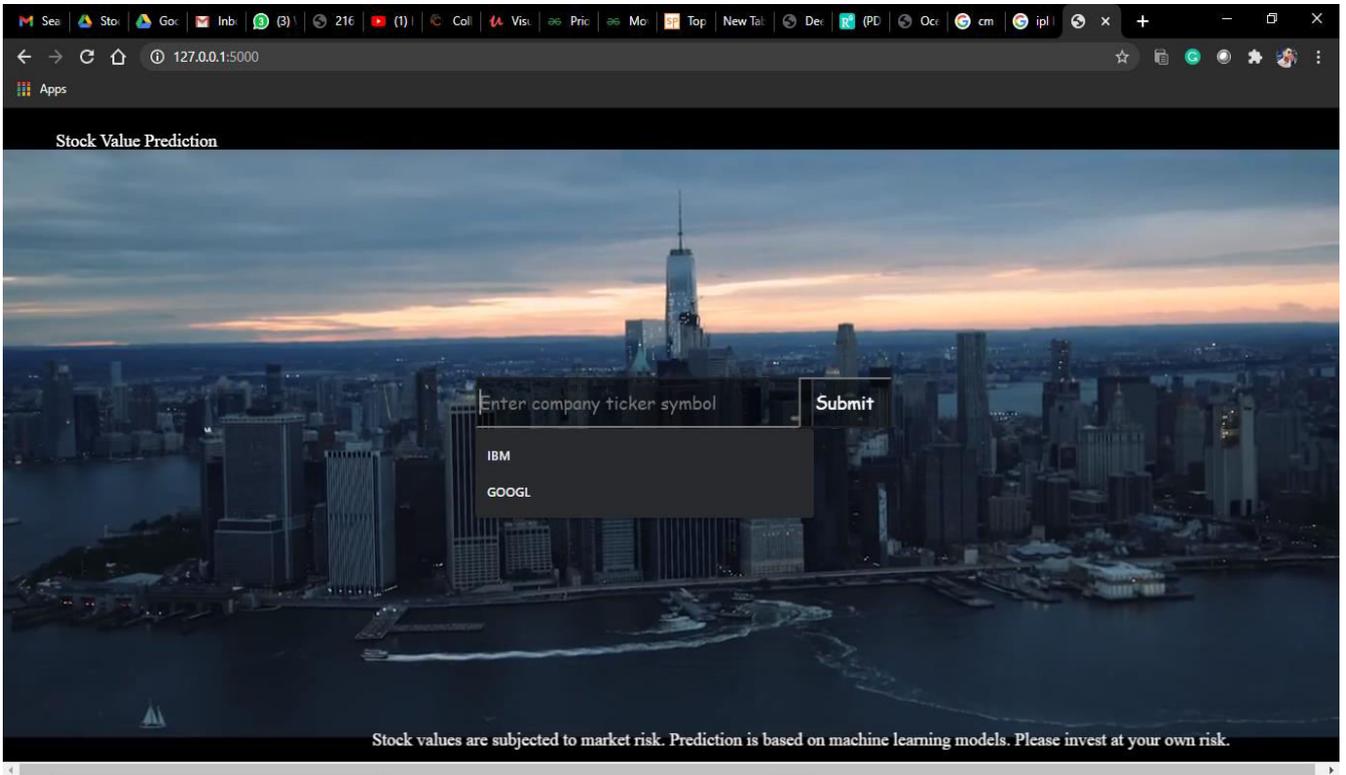


Figure 4 – Web application integrated with algorithm



Figure 5 – Comparison between the actual and predicted value



V. CONCLUSION AND FUTURE ENHANCEMENT

Two techniques have been utilized in this project: LSTM and CNN, on the Kaggle dataset. Both the techniques have shown an improvement in the accuracy of predictions, thereby yielding positive results. Use of recently introduced machine learning techniques in the prediction of stocks have yielded promising results and thereby marked the use of them in profitable exchange schemes. It has led to the conclusion that it is possible to predict stock market with more accuracy and efficiency using machine learning techniques. In the future, the stock market prediction system can be further improved by utilizing a much bigger dataset than the one being utilized currently. This would help to increase the accuracy of our prediction models. Furthermore, other models of Machine Learning could also be studied to check for the accuracy rate resulted by them.

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