

Prediction of Equity Market using Deep Learning

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Abstract— Stock market prediction has been an area of interest for investors as well as researchers for many years due to its volatile, complex and dynamic nature, making it difficult to make reliable predictions. Predicting stock price is a challenging task. Computer aided systems (CAD) have been proved to be helpful tool for stock prediction. The paper proposes a new way to predict stock market values. The proposed model predicts the stock market values by combining the result of the sentiment analysis and data provided applying Recurrent Neural Network (RNN). The sentiment analysis is been applied on the real time tweets provided by the Stock Twits and are been classified accordingly into categories. The exact categorization of people's mood before investing into stock has been done. Along with it recurrent neural network (RNN) is used for prediction. This technique predicts the price of a stock or stock values so as to make investment. The model might increase the accuracy for prediction. The system would help the users to avoid the loss and gain maximum profits for the stakeholders. The major contribution of this paper is that it encapsulates the current state of Deep Learning applications in market industry.

Keywords— Naïve Bayes, recurrent neural network (RNN), sentiment analysis, stock market.

I. INTRODUCTION

Deep learning is generally used for estimation and approximation of unknown functions. These functions and systems depend on a large number of input variables. Neural networks obtain their intelligent behavior by learning from the provided data or from interactions with environment. For this study the supervised learning (training) methods are employed. In supervised training pairs of input-output data must be provided to the network and the network will try to learn the mapping implied by that data. The robustness of the neural network often depends on the training algorithm that was used to learn the data. In deep learning, a computer model learns to perform classification tasks directly from images, text, or sound.

These models are trained by using a large set of labeled data and neural network architectures that contain many layers, most models use neural network architectures. These models are trained by using large sets of labeled data. The uncertainty of rise or fall of shares in stock market can lead to tremendous loss for the stakeholders; to avoid the losses or to gain profits in the Stock Market building a system that predicts the future stock values will be fruitful. The existing system uses Support Vector Machine (SVM) algorithm on Stock Twits API. In general while buying or selling any stock, the public reviews are mostly not considered. The existing system uses Sentimental Analysis along with the Yahoo Finance dataset in leading to less accuracy. The proposed system will be using combination of previous data of the stocks and the sentiments from the public, which may help to tell whether to invest in stock.

II. RELATED WORK

J. Li, et. al. [1] described about prediction of Stock market using Long Short Term Memory (LSTM) technique along with Naïve-Bayes for sentiment classification on China Stock Index CSI300. It gives an exact idea of working layers in Neural Networks and also showcases the potential of Deep Learning financial time series in presence of strong noise. For classification only Naïve Bayes algorithm is used, instead various other algorithms can be used such as Support Vector Machine (SVM), Random Forest (RF). S. Khatri, et. al. [2] implemented a system for stock values prediction, applying Sentimental analysis on data extracted from Twitter and Stock Twits to predict future market values using Artificial Neural Network (ANN). The comparative study between actual closing values and sentimental score concludes that, investing in companies with higher sentimental score will yield profits in future market. ANN reduces the error rates and increases the prediction accuracy. Better outcomes were predicted only if data samples for larger period are considered, becomes its drawback. S. Selvin, et. al. [3] proposed a paper describing a model independent approach for stock value prediction using three different Deep Learning architectures namely Long Short-Term

Memory (LSTM), Recurrent Neural Network (RNN) and Convolution Neural Network (CNN) along with Sliding Window method. The paper compares the three Deep Learning architectures, concluding CNN as the most accurate (for the data available at present instant). It states, CNN is capable of identifying the changing trends, favoring the dynamic nature of the stock market, while LSTM and RNN favor historical data and static nature.

M. Motlagh, et. al. [4] proposed a paper describing a method for multi-step ahead prediction based on Recurrent Neural Network (RNN), Real Time Recurrent Learning (RTRL) network, and Nonlinear Autoregressive model process with exogenous input (NARX), applied on Tehran Stock exchange. RNN can be used in the prediction for various Time-series applications like Peak power load forecasting and stream flow forecasting. M. Vargas, et. al. [5] stated in paper, comparison between Recurrent Neural Network (RNN) and Convolution Neural Network (CNN) and Recurrent Convolution Neural Network (RCNN) their performance for stock prediction on Standard & Poor 500 index. Sentence embedding is better than Word embedding, leading to improved performance and efficiency. R. Nivetha et. al. [6] proposed a paper describing a comparative study of three algorithms namely, Support Vector Machine (SVM), Multiple Linear Regression (MLR), Artificial Neural Network (ANN) for predicting. It compares various algorithms like SVM, MLR and ANN, concluding that ANN yields better outcomes and better efficiency. The monthly prediction need historical data while the daily prediction requires the social media data i.e. present data, thus the model increases complexity.

III. PROPOSED SYSTEM

The proposed system mines tweets using StockTwits’s API and subsequently processes them for further analysis, which includes Sentiment Analysis. Applying naïve bays to predict each tweet’s sentiment. Later it evaluates each model for its proper sentiment classification; the system discovers that neural network gives higher accuracy through cross validation. Despite this fact, the proposed system continues to take into consideration both techniques. After predicting every tweet’s sentiment, the system mined historical stock data. The system then creates a respective feature matrix for stock market prediction using sentiment score and stock price’s change for each day and at the end proposes the trading strategy.

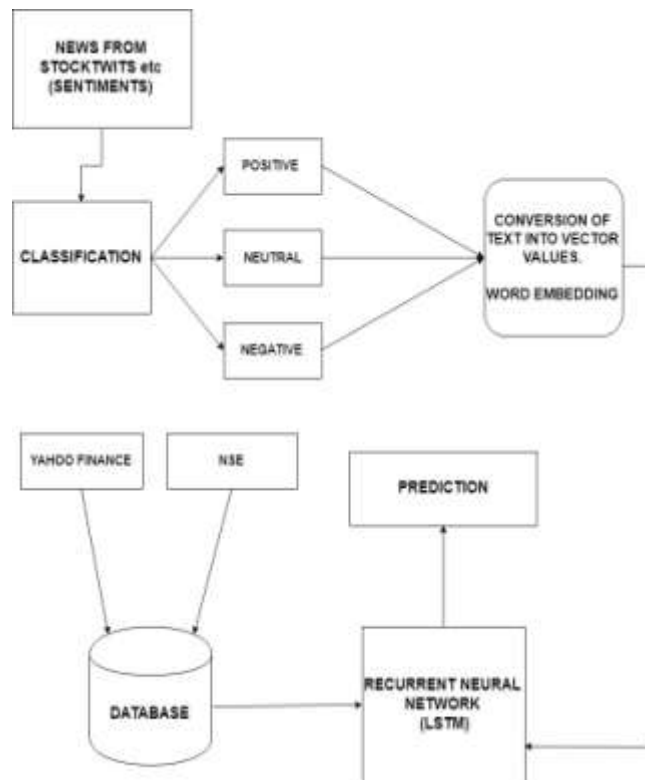


FIGURE 1: System Flow diagram

Figure 1. describes the system flow of the model. The system is divided into two major components, sentiment analysis and neural network model. In sentiment analysis naïve bayes is used to classify into three classes positive, negative, neutral. In prediction model, data from the stock is considered as input to predict the stocks. Later the combination of both the components is fused to form an output which will help to buy or sell the stock.

IV. RESULTS

The combination of both models leads to predict the output of the system. The combination of sentiment analysis and data prediction from RNN leads to output. The result of sentiments are classified into three classes positive, negative, neutral as shown in figure 2.

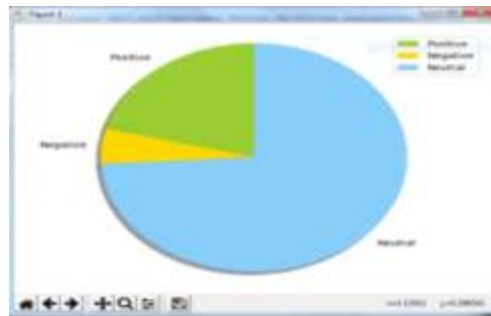


FIGURE 2: Sentiment Analysis

V. CONCLUSION

The proposed system is a new method for prediction as both data and sentiments are considered for prediction. The previous system considered only one of the factor for prediction which will be solved by proposed system. The proposed system would be useful to understand the exact stock price and its nature considering the news, and would help user to decide to buy or sell the stock. The proposed system aims to provide a system with good accuracy for the detection of using deep learning. For this purpose, the proposed system will be making use of Sentimental analysis and Deep Learning Recurrent Neural Networks. The use of Recurrent Neural Network will greatly improve the accuracy of the system. Deep Learning is more powerful than conventional Machine Learning algorithms due to the computations in hidden layers. Thus we conclude, that the proposed system predicts the stock values with higher accuracy and showcases the appropriate period for investments.

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