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STOCK PREDICTION THROUGH MACHINE LEARNING AND EMOTION DETECTION

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ABSTRACT

The thrust of this paper is to highlight the importance of prediction of stock marketing and a different models to achieve it. We have proposed a model to predict stock through machine learning and emotion detection. Firstly the prediction is done through Hidden Markov Model and them final result is computed with the cached emotion of previous day.

Keywords: Stock Prediction; Stock Forecasting; Managing Stock; Stock Analysis; Emotion Detection

I INTRODUCTION

From its birth, the stock market has always been a place where businessmen could gain capital by selling shares of their companies and where investors can purchase these shares in hope to make a profit when those companies prosper. Although the market still serves both these purposes, today it is judged less by what it does for businessmen seeking capital but rather for what it can do for investors seeking gain. In a time of high taxes and low wages, trading stocks seems like a viable and almost effortless way of becoming very rich very quickly. Although this scenario has proven true for many, there are just as many, if not more, who can proclaim the exact opposite. The problem here lies with the fact that the same volatility in the market that can be exploited for gain, can be the cause for loss as well. As both amateur and knowledgeable investors, this is what worries as. For day to day trading, these risks are a major factor in keeping away new, eager yet unaccustomed, traders from the market. They lack the appropriate tools needed for the decision making process when compared to existing professional traders. This scenario is witnessed way to often and can range from the young wanting to have a steady stream of capital without the need to invest in a part time job whilst also being a full time student or even the old who are well established into life attempting to save up for retirement. In both of these cases, these are individuals who would gladly consider trading stocks but many a times shift away from the idea due to the lack of time, recourses, and knowledge in the field. To the college students amidst us, the idea of "gambling" in the stock market is fear inducing. Today, to turn this "gamble" into at most an informed estimate we would have to go through hours upon hours of research to first acquire the knowledge needed to even begin to understand how trading decisions are made. Understanding is only the first hurdle, however. Once one knows how to read charts, number crunch historical prices, or acquire and comprehend a company's balance sheets amongst many other details, the act of actually performing these tasks remains, something easier said than done. As students, the time and energy needed for such undertakings simply does not exist. This dilemma is one of which anyone foreign to

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the field of stocks can relate to. The long-term investors among us, on the other hand, rely on a research heavy way to invest. There methods entail analyzing the financial performance of many companies and choosing the ones that appear to have the best growth potential. Since their prospects are long term, it may seem at first that the volatility of the market can be of no help here. Even these types of investors, however, are looking for as much profit as attainable and therefore do not overlook purchasing a stock at the lowest price possible. Thus, they too rely on the technical analysis techniques of day to day traders. Even with their acumen of the field, however, number crunching and attempting to eyeball trends off of charts for these split second decisions can not only be time consuming and stressful but are also prone to human error. There are several factors that explain why technical analysis works:

1. Most speculators on the market act upon fundamental analysis, so that kind of facts influence stock prices strongly. But all operators do not get this information at the same time. When there are positive news of a company, those acting immediately can buy shares for a lower price than those getting the news later.

2. It is part of a company's nature to rest in good or bad periods. In good periods, the probability that good news will be followed by more good news is larger than the normal. Because the market often reacts on every single event this may result in a chain effect – a positive trend for the stock.

3. Large investors such as mutual funds and banks are often not placing their whole block orders at the same time when they are buying larger quantities of securities because this would risk triggering an unnecessary high price advance. Instead, the orders are spread over a period that can last several weeks. The resulting increased purchase pressure may result in a steady advancing trend under the period the purchases continue.

There are many tools available to investors using technical analysis but none of them removes entirely the element of chance from investment decisions. Large trading organizations can employ sophisticated computer systems and armies of analysts. We, attempt to employ a simple set of formidable techniques to achieve the same result for the benefit of smalltime investors who cannot afford to hire experts or buy costly software to make their investment decisions.

II LITERATURE SURVEY

Stock prediction exists with us from many decades and plays a most vital role in stock market investment. Many intellectual minds have contributed towards the development in this field. We are describing few of the revolutionary contributions.

1. Estimation Methods for stochastic volatility models by Carmen Broto and Esther Ruiz:

This research states that although stochastic volatility (SV) models have an intuitive appeal, their empirical application has been limited mainly due to difficulties involved in their estimation. The main problem is that the likelihood function is hard to evaluate. However, recently, several new estimation methods have been introduced and the literature on SV models has grown substantially.We describe the main estimators of the parameters and the underlying volatilities focusing on their advantages and limitations both from the theoretical and empirical

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point of view. We complete the survey with an application of the most important procedures to the S&P 500 stock price index. [1]

2. Stock Price Forecasting Using Information from Yahoo Finance and Google Trend by Selene Yue Xu :

This paper discusses about time series analysis which is the most common and fundamental method used to perform this task. This paper aims to combine the conventional time series analysis technique with information from the Google trend website and the Yahoo finance website to predict weekly changes in stock price. Important news/events related to a selected stock over a five--year span are recorded and the weekly Google trend index values on this stock are used to provide a measure of the magnitude of these events. The result of this experiment shows significant correlation between the changes in weekly stock prices and the values of important news/events computed from the Google Trend website.

III PROPOSED WORK

For machine learning we used Hidden Markov Model algorithm as HMM is the most commonly used technology that can be constructed to predict market trends in short term, although it is far from perfect. Advanced mathematical nature of HMM has restricted it to financial analysis within academic circles.

We have fetched previous one year data from Yahoo Finance and cached it in our database. Calculation of moving average for opening and closing stock is done and then the difference between opening and closing stock and their moving average is calculated. For the calculation ok bins we have used the formula which is predefined as:

$K = \sqrt{N}$

K = number of bins

N = number of reading taken

Then the width of the bin is calculated by:

W= (max diff – min diff)/K

Where max and min diff are difference between opening and closing stock and their moving average.

The intervals at N/4, 2N/4, 3N/4 based on quartile Calculation and labeled as P1, P2, P3, P4. Then steady state probabilities are calculated by multiplying transition matrix by πj. Our transition matrix is shown in fig 1.

Each column of matrix represent the probability of lying in particular interval which is calculated based upon bin. Let us assume that our transition matrix is represented by T. We iteratively compute T2, T3, T4,… T8. We stop at T8 because we observe that the probabilities take a constant value after 5 or 6 iterations.

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$$\begin{bmatrix} P11 & P12 & P13 & P14 \\ P21 & P22 & P23 & P24 \\ P31 & P32 & P33 & P34 \\ P41 & P42 & P43 & P44 \end{bmatrix}$$

Fig. 1

Then to find the probability lying in particular range, we multiply our transition matrices with the steady state probability matrices shown in Fig 2.

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 \end{bmatrix}$$

$$B = \begin{bmatrix} 0 & 1 & 0 & 0 \end{bmatrix}$$

$$C = \begin{bmatrix} 0 & 0 & 1 & 0 \end{bmatrix}$$

$$D = \begin{bmatrix} 0 & 0 & 0 & 1 \end{bmatrix}$$

Fig. 2

Further we detect the emotion of visitors on our website and use it for analyzing stock prediction on sentimental basis and then merge it with data computed through machine learning algorithm.

We have computed eight major emotions and then provide appositive weightage to emotion like happiness and surprise, negative weightage to disgust, fear, sadness and contempt.

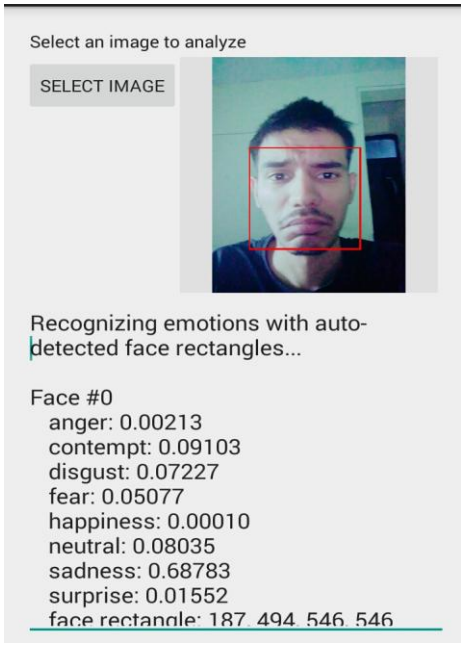

Fig. 2

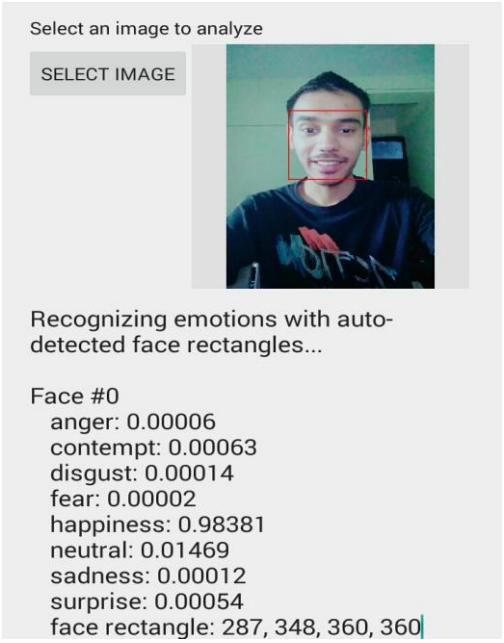

Fig. 3

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Adjusted Stock Prediction through Emotions:

Predicted Stock + ∑ Emotions

As discussed previous predicted stocks have been computed through machine learning algorithm and emotion detection will be added as per their weightage. i.e. (happiness-sadness+surprise…) and neutral emotion will be multiplied with 0 to neglect its impact.

IV FUTURE WORK

We have worked on a model to predict the stock based through Neural Network and emotion detection algorithm. We will now work on improving the accuracy for stock prediction of this project by observing more results associated with it.

V ACKNOWLEDGMENT

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