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Stock Market Prediction using Alpha Vantage API and Machine Learning Algorithm

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Abstract - *Portfolios, stock market predictions, risk and debt management are all important pillars of the financial world. These pillars rely heavily on quality and accurate prediction. Today, however, with the unpredictability of markets and the rise of electronic trading platforms, trading analysis and predictions have to range from a few seconds to days and months with data available and the data that is getting processed in the present. These are problems that, affect individuals and their financial conditions and, can be detrimental to a country's financial stability. Stock traders are moving towards to use Artificially Intelligent Trading Systems rather than fundamental analysis for predicting prices of stocks, which helps them to take immediate buy or sell decisions. One of the main aims of a trader is to predict the stock price such that he can sell it before its value decreases, or buy the stock before the price increases to make profits. We are developing a system in which we are providing the stock market predictions based on the historical data and also with the help of machine learning algorithms. It will give accurate result which will help the traders or investment firms to maximize their profit.*

Key Words: Stock Market, Electronic Trading Platform, Historical Data, Prediction, Artificial Intelligence, Machine Learning Algorithm.

1. INTRODUCTION

Since their inception, online groups about finance have obtained a developing interest as a legitimate supply of marketplace evaluation. Stock marketplace evaluation is one of the thrilling regions of research. Lots of buyers are worried about marketplace and they're all involved to understand extra information to the destiny of marketplace on the way to have extra-success in investments. Effective marketplace prediction can assist buyers with alternate advices. Sometimes prediction systems assist buyers with the information about future stock direction of company. E.g. if the route of a particular stock at some point of 24 hours is anticipated to be "up", shopping for the stock might be a worthwhile buying and selling action. In Current System consumer's each day checkout the stocks info and it is time consuming task. Hence, so as to conquer this we're going to develop software to make it easier for users. In this system we will keep the information about the Company and users. In this system admin do the registration of the corporation. Whenever required admin replace the statistics approximately corporation like stocks. Admin see the listing of corporation and ship messages to all users. Users carry out operations like buy and sale the stocks of corporation. In this system, principles like automation and prediction are used for enhance the overall performance of the system. By the use of automation consumer set restoration rate of proportion then stocks are automatically sale or buy. And prediction idea is used with historical stock data using Alpha Vantage API. By using historical data of company we will predict future stock prices of that company.

1.1 Problem Statement

Stock market prediction is prediction system software that reduces the risk that undergoes during the investment in stock market. It predicts the stock rates acknowledging the historical data of stocks and the statistical analysis in front of users. Investment during a fiscal day determines the stock prices of stock market for the next day. This project helps in bridging the resources and empowering the humans to know and trade the stocks and make extra-profits on their portfolios. The enhancement of the prediction is done with the help of Alpha Vantage API and Machine Learning Algorithms which makes an user or the customer to analyze the stocks and take the investment decisions. Forecasting of the stock prediction is done by the available historical data source and the prediction is done for the upcoming day.

1.2 Objective

One of the main aims of an investor is to predict the stock price such that he can sell it before its value decline, or buy the stock before the price rises. Our objective is to develop a system in which we are providing the stock market predictions based on the historical data and with the help of machine learning algorithm. It will give prediction result which will help the investors, traders or investment firms to maximize and increase their profit. The Alpha Vantage API will be used to obtain historical and real time data for stock market. Six attributes for each company will be used for prediction. These are the opening price, closing price, highest price, lowest price, volume and adjusted closing price. We are using Naive Bayes Machine Learning Algorithm for predicting stock prices based on historical data obtained from Alpha Vantage API.

2. RELATED WORK

[1]Alberto Fernández, Sergio Gómez(2005) applied a heuristic method with the aid of ANN to find the efficient frontier of portfolios in their paper. They used a generalized form of the Mean -Variance model. They concluded that the neural network gave better solutions than other heuristic methods.

[2]Chi-Ming Len et al (2006) used a recurrent neural network on the portfolio selection problem using var model.

[3] Yung-Keun Kwon et al (2007) used in their empirical studies a hybrid neurogenetic system for stocks. They proposed a one hidden layer RNN for prediction. The Genetic algorithm optimized the weights applied to the network.

[4]Po-Chang Ko and Ping-Chen Lin (2008) proposed neural network in selection of portfolio in the Taiwan stock market. Their work remarked about the effectiveness of their method.

[5] Freitas et al. (2009) used neural network to predict short term investment returns. They carried out their work on large data sets from Brazilian Stock Market. They revealed that their framework outperforms the traditional Mean variance model in the case of short term investments.

[6] Zhao-Rong Lai et al (2018) proposed a Radial Basis Function for portfolio selection. They tested the data on six benchmark datasets and it indicated that their proposed work achieves superior performance and control of risk. In their RBF network they used AICTR (Adaptive Input and Composite Trend Representation). This particular method runs very fast according to their findings.

[7] Jinho Lee et al (2019) in their paper presented the application of Deep Q-Network that could predict stock market with the use of Stock chart images.

[8] Nhi N.Y. Vo et al (2019) prepared a Deep learning network for optimizing socially responsible Portfolio. They introduced what they called as DRIP (Deep Responsible Investment Portfolio) which included an LSTM neural network that predicts returns of stocks to construct an optimized portfolio. Their result shows that their framework was giving better social impact as compared to traditional models.

[9] Wuyu Wang et al (2020) propose Deep learning with pre-selection to construct optimal portfolios. Their model outperforms other five baseline strategies in terms of prediction of returns and reducing risks.

3. PROPOSED SYSTEM

The system architecture of stock market prediction using Alpha Vantage API and Machine Learning Algorithm is shown in below Fig.1.After user login into the system user can select the company for stock prediction .When user selects company for prediction our system obtains historical data of that particular company from stock market using Alpha Vantage API. User can view the past company performance with six attributes -opening price, closing price, highest price, lowest price, volume, adjusted closing price.

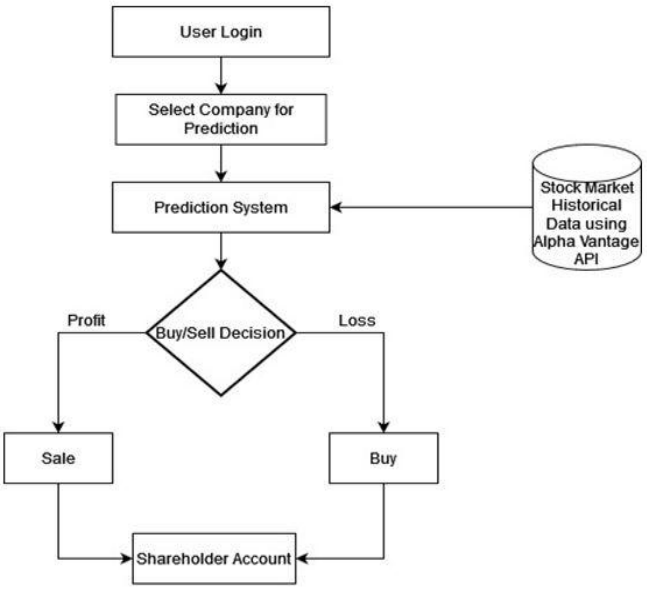

Fig -1: System Architecture of Stock Market Prediction using Alpha Vantage API and Machine Learning Algorithm

3.1 Naïve Bayes Algorithm

Gaussian Naive Bayes is a type of Naive Bayes that uses Gaussian normal distribution and supports continuous data. We are using Naïve Bayes Machine Learning Algorithm for predicting stock prices for the next day using company historical data. Naive Bayes Algorithms are a group of supervised machine learning classification algorithms using Bayes theorem. They used when the dimensionality of the inputs is high. Complex classification problems can solve by using Naive Bayes Classifier. Gaussian Naive Bayes Algorithm supports continuous valued data and models each as conforming to a Gaussian (normal) distribution. An approach to make a simple model is to assume that the data is described by a Gaussian distribution with no co-variance between dimensions. This model can work by simply finding the mean and standard deviation of the points within each label, which is used to define such distribution. Following were the important steps to be performed in this Gaussian Naïve Bayes Algorithm:-

1. We calculate the probability of data by the class they belong to, the base rate. We first separate our training data by class. We create a dictionary object where each key is the class value and then add a list of all the records as the value in the dictionary.

2. We need two statistics from a given set of data. The two statistics we calculate from a given dataset are the mean and the standard deviation.

3. After that we separate a dataset into rows by class. And we calculate summary statistics for each column. We put all of this together and summarize the columns in the dataset organized by class values.

4. A Gaussian distribution summarized using only two numbers: the mean and the standard deviation. Therefore, we estimate the probability of a given value. This math is called a Gaussian Probability Distribution Function.

5. Probabilities are calculated for each input value in the row using the Gaussian probability density function and the statistics for that column and of that class. Probabilities are multiplied together as they accumulated.

6. The class with the highest posterior probability is the outcome of prediction.

4. ADVANTAGES

The advantages of stock market prediction using Alpha Vantage API and Machine Learning Algorithm system include:

1. Making it easier for traders/investors to realize their investment.
2. System will help to increasing your portfolio, and provide accurate predictions for stocks.
3. The system alerts to the stock holder whether he is in profit or in loss.
4. Automatically sale or purchase shares using automation concept for increase profit.
5. Reduces investor's time.
6. The system will help to find stock market value as per stakeholders need.
7. System maintains the records about the users and companies and it is also easily accessible to all details of company and stakeholder.

5. CONCLUSIONS

Our prediction system is share details of current market and history of share market. The prediction system will predict possible future rate for stocks. Prediction details and current details will used for decision making. Input to that decision making system is our stored prediction details. Decision making system takes the decision that either we have to sale the share or we have to purchase it. By using machine learning algorithms for trading and investment purpose, we can identify the patterns in the market, assess the investment risks, and analyze the behavior of the people.

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