Stock Prediction Using Evolution Strategy

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Abstract— **In Day Trading, there are lot of things you have to understand. There are all these fancy terms, technical indicators and background knowledge that you have to understand to trade effectively. You have to understand order types, indicators, things related to account activities. We have taken this complex topic and made it even more complex by adding this wonderful world of programming into it.**

Stock Trading has ended up playing a significant function for the financial specialists of various organizations and the day traders. Understanding the reasons for market fluctuations in their beginning phases is the place where the brokers and investors slack. The fundamental goal to put resources into the market is to get capital returns and benefits.

We will be building up a bot that that can take trading strategies and execute them in an automate fashion with minimal or limited interaction. We have to be explicit with how we trade in order to make the bot understand how we want it to trade and define the type of orders, the quantity, the profit margins and when to exit the trade. One of the most important objectives of the trading bot and what it has to do to function the way we want it to do would be to stream quotes, i.e., get price information which would further help in calculating indicators, placing orders and organizing our data. This bot also has to check for any fluctuations in the market as referenced before, study that data and cautiously contribute on just those stocks which give at least 1 percent return using several algorithms like sentimental analysis and evolutionary strategies from reinforcement learning. In this project, we use ZerodhaApi which will act as a data set to provide a huge pool of data to the bot to make it understand and asses the market better.

I. LITERATURE SURVEY

- • Graham Kendall first came with evolution strategy uses in artificial intelligence in 2001 in his research work "EVOLUTIONARY STRATEGIES; A NEW MACROECONOMIC POLICY TOOL?"[1]. This research work discussed the development of an approach that usedEvolutionary Strategy as a predictive tool. The approach was simple to implement yet produced results that compared favorably with the neural network predictions.

- • Lufuno Ronald Marawala in 2010 reckoned about Artificial Intelligence application in Stock Market and Trading in his research paper "Forecasting the Stock Market Index using AI techniques"[3]. The main motive of this work was to make use of AI techniques to model and predict the future price of a stock market index. The results indicate that the ranking of performances support vector machines, neuro-fuzzy systems, multilayer perceptron, and neural networks is dependent on the accuracy measure used.

- • Luke Rose in 2018 came across the topic in his research paper "Automated Stock Market Trading using Machine Learning"[2] where the project dives into and compares the recent Machine Learning approaches used in predicting the direction and prices of selected stocks for a certain time range, considering short, medium, and long-term investments.

- • Yang Xiang in 2019 made a detailed observation and analysis on the stock day trading strategy in his research work "An Empirical Study of Machine Learning Algorithms for Stock Day Trading Strategy"[4]. In this research paper, the author synthetically evaluates different Machine Learning algorithms and observes the day trading performance of stocks under transaction cost and no transaction cost.

II. INTRODUCTION

In the 21st century, Stock Trading has turned out to play a pivotal role for the investors of different companies and the daily traders in the market. The market irrespective of the people who invest in or tradeoff, works on its own principles 2 with different crests and troughs each day. The market fluctuating everyday due to different reasons brings in difficulties for companies and stockbrokers to decide capital investment. These difficulties can occur due to a plethora of reasons like company getting dissolved, conflicts within the company or company bankruptcy etc. Generally understanding these difficulties in their early stages is where stockbrokers and investors lag. Also, the main objective to invest in the market is 3 to get capital returns and profits. Even though if it means getting at least 1depending on the investment 12 return. So for stockbrokers and investors reaching at least 1 percent return mark can change the face of their company making it possible for them to reach 4 successful heights in the market. We here as a team will be developing a bot that would be handling the stock trading process. This bot, with the help of sentiment analysis will go through 5 different forums and sites to check for any fluctuations in the market as mentioned 6 earlier and will carefully invest on only those which provide

at least 1 percent return. The data will be extracted from the ZerodhaApi which is one of the leading stock trading applications. This database will provide a large pool of information to the bot which will ultimately navigate it through the stock trading process.

III. METHODOLOGIES

A. Day Trading

Some time ago the people who had the option to trade effectively in the financial exchange were those working for enormous budgetary establishments, businesses, and exchanging houses. Nonetheless, with the ascent of the web and internet exchanging houses, it has gotten simpler for the normal individual speculator to get in on the game. Day Trading[6] as rule alludes to the act of buying and selling a security inside a solitary exchanging day. While it can happen in any commercial center, it is generally normal in the unfamiliar trade and securities exchanges. Informal investors are commonly knowledgeable and all around financed. They utilize high measures of influence and transient exchanging methodologies to profit by little value developments that happen in profoundly fluid stocks or monetary forms. Informal investors are sensitive to functions that cause transient market moves. Exchanging dependent on the news is a well-known method. Booked declarations, for example, financial insights, corporate profit, or loan fees are liable to showcase desires and market brain research. Markets respond when those desires are not met or are surpassed for the most part with abrupt, critical 4 moves–which can extraordinarily profit informal investors. Informal investors utilize various intraday procedures.

Characteristics

Professional day traders—the individuals who exchange professionally as opposed to as a diversion—are normally entrenched in the field. They for the most part have inside and out information on the commercial center, as well. Here are a portion of the essentials needed to be an effective informal investor.

- Information and Experience in the Marketplace : Individuals who attempt to day trade without a perception of market fundamentals much of the time lose money. Specific assessment and graph scrutinizing are both satisfactory capacities for a casual financial specialist to have. However, without a more all around appreciation of the market you're in and the assets 7 that exist in that market, layouts may be misleading. Do your due resoluteness and appreciate the particular multifaceted subtleties

of the things you trade.
- Adequate Capital: Casual financial specialists use just peril capital which they can remain to lose. 8Notwithstanding the way that this shields them from cash related ruin, yet it also slaughters feeling from their trading. A great deal of capital is often essential to guarantee effectively on intraday esteem advancements. Moving toward an edge account is in like manner key since erratic swings can cause edge moves toward short notice.
- Methodology: A broker necessities an edge over the remainder of the market. There are a few distinct procedures informal investors use including swing exchanging, exchange, and exchanging news. These methodologies are refined until they produce predictable benefits and successfully limit misfortunes.
- Discipline:A beneficial procedure is pointless without discipline. Numerous informal investors wind up losing a ton of cash since they neglect to make exchanges that meet their own rules. As is commonly said, "Plan the exchange and exchange the arrangement." Success is incomprehensible without discipline. To benefit, informal investors depend intensely on instability on the lookout. A stock might be alluring to an informal investor if it moves a ton during the day. That could happen due to various things including an income report, speculator opinion, or even broad financial or organization news. Informal investors likewise like stocks that are intensely fluid since that allows them to change their situation without modifying the cost of the stock. On the off chance that a stock value moves higher, merchants may take a purchase position. If the value descends, a dealer may choose to short-sell so they can benefit when it falls.

AI and Day Trading

Artificial Intelligence can be summarized as a technology that can think and act for itself, and therefore it is perfect for complex trading applications where speed and efficiency play a pivotal role. Its application will change trading in many ways, and which is quite evident already.The advantages of Artificial Intelligence equipped trading with respect to human trading is that Artificial Intelligence pertains predetermined trading rules, trades 24 hours a day, zero emotional breakdowns, understands risk management and the list goes on. Artificial Intelligence seems like the perfect tool for the financial market, using forecasts to make vital trading decisions. Financial success depends heavily on predicting where the market is heading. A.I is predictive by nature and can analyze mass data sets with incredible speed and accuracy, it's not difficult to see why businesses in the sector have been quick to adopt A.I and machine learning. A.I is so valuable

when it comes to maximizing potential gain, especially when it can gather so much information about the financial climate and simulate risk scenarios.

B. Sentimental Analysis

Our phones do a lot for us; they check the weather for us, they wake us up in the morning and a lot or more to make our lives easier. But there is one thing our phones cannot do yet, i.e., tell us how we are, how are our emotions. Sure, we can use devices like Fitbit, etc. that helps us monitor our health but it is hard to understand our emotions. Some emotions are hard to express, let alone, understand. That's where sentiment analysis can help us. It analyses our emotional data to help us make optimal decisions for goals that we specify like our own therapist or a life coach. Sentiment Analysis categorizes opinions, emotions or attitudes expressed by consumers towards a particular topic, issue, event or subject is positive, negative or neutral. It is a valuable tool for monitoring social media as it helps us to determine an overview of the general opinion of the public behind certain subjects. Every day, large volumes of text data is created and is unstructured or unorganized. Sentiment analysis can help in sorting large scale data efficiently. It can perform real-time analysis helping businesses to take actions timely. Sentiment in text can be highly subjective. Using sentiment analysis, companies can bring the data under a consistent criterion improving the accuracy of the consumers' emotions towards the company product, brand or status.

There are generally two main approaches to sentiment analysis- 1. Rule based – We split the given text (words, phrases or sentences) into smaller tokens. This process is known as tokenization. Then we count the number of times each word shows up. This tally is called bag of words model. Next, we look at subjectivity of each word from an existing lexicon which is a database of emotional values for words pre-recorded by researchers. Once we have the values, we can then compute the overall subjectivity of our text. In this approach rules are set manually to identify the polarity of the sentiment. This approach has many drawbacks as no ruleset can determine sarcasm, double-meaning, abbreviations in a given text. 2. Machine Learning –If we have a collection of tweets labelled positive (1) or negative (0), we can train a classifier on it and then given a new tweet, it will classify it as either positive or negative. This approach is more accurate as it creates abstract representations of what the model learned. These generalizations are called vectors and can be used to classify data with the help of several classification algorithms. Using the ML approach, we can grab the URL that we want to scrape some data off of, apply little natu-

ral language processing on the data, create a TextBlob object and get the polarity of the text, i.e., the sentiment (1=positive, 0=neutral, -1=negative) There are many applications for sentimental analysis, like, social media monitoring- understanding customer sentiment towards the product, service or brand and gain actionable insights or track the trending topics, brand monitoring- identify any PR issues and understand customer's attitude towards the brand, voice of customer- gain insights into large scale customer reviews and tweets, market research –follow real time events, predict future trends in order to gain advantage over the competition. Currently the application of sentiment analysis is purely commercial, for example, we see movie producers using sentimental analysis to evaluate audience feedback on their recent projects or we see corporations using this technology to assess how consumers are reacting to their product. But with the advancement in this technology, we can see countless applications of this technology. Sentiment analysis can be used to help people with mental health issues. Many people with these issues find refuge in the internet. Therefore, with this technology we will be able to provide help to the people who might have been reluctant to seek it. As internet has become a hub for radicalization, this technology can be used by the governments to make the internet safer for the people. This can even lead to our phones becoming our own therapists helping us understand, express or cope with our own emotions. Twitter is an ocean of sentiments. People around the world put thousands of reactions and opinions on every topic there is, every second, every day. It is like a big psychological database that is constantly being updated. We can use it to analyze millions of tech snippets in seconds with the help of machine learning[7][9]. Our process will be to register to Twitter API, install our dependencies and then write our sentiment analyzer script. First, we sign up to use Twitter's API. Applications programming interface is a gateway that lets us access some servers' internal functionality; in this case, Twitter[8][10]. In order to communicate with twitter and use its API, we create an open-sourced app. It lets us authenticate or verify our identity with Twitter. We create the app by signing in to dev.twitter.com.

The first dependency we install is Tweepy, which is our library for accessing the Twitter API. The other dependency is TextBlob which helps in the actual sentiment analysis. After importing the libraries, we have to create 4 variables, consumer-key, consumer-secret, access-token and access-token-secret, that are required to authenticate with twitter. These variables can be copied and pasted as strings from the app dashboard. We authenticate with twitter by creating a variable auth and using 0AuthHandler method of Tweepy. This method takes two arguments, i.e., consumer- key and consumer-secret. Then we call the set access token method

on the auth variable which takes two arguments, i.e., access-token and access-token-secret. Now, we create our main variable from which we would be able to read the tweets and communicate with the platform using its API[11]. We call it API and assign it a value from API method of Tweepy which takes a single authentication argument, i.e., auth. With the API variable, we can perform several methods like create or delete tweets or find twitter users. For our use case we want to collect tweets that contain a certain keyword. We create a public tweets variable that will store a list of tweets and call the search method of the API variable to fill it. The search method takes a single argument. This method then retrieves a bunch of tweets that contain the word inserted as the single argument(for example- name of a company). Here, we can print them all out by creating a for loop in public tweets method. The loop increments through every value in the list. We can print the tweets. Each tweet has a string attribute which is the string version of it. Now we can perform our sentiment analysis by creating an analyst variable that will store our analysis and call TextBlob with our tweet string as the only argument. Then we can print out the sentiment attribute of the analysis variable. As a result, we are able to see the live tweets that we fetch from the Twitter and can see a sentiment report which shows the polarity, which measure how positive or negative some text is and subjectivity that measures how much of an opinion it is vs how factual. From this we can see that, sentimental analysis[12] is the process of understanding and extracting feelings from data. This shows that sentiment plays a huge role in stock trading as the sentiment decides if the stock is going to be bullish or bearish and helps the consumer to decide whether to sell the stock or buy it.

C. Reinforcement Learning

Machine Learning techniques were basically introduced to reduce the human labor mentally or physically. This was only achievable if we could know how we can make the machines intelligent enough. The sole purpose of this advancement was to make machines capable enough so that they can learn and perform assigned tasks themselves. There are three categories of learning- supervised learning, unsupervised learning and Reinforcement Learning. We have used the latter in our project. Reinforcement learning is derived from supervised learning but the major difference here is that in supervised learning we were aware of the output but in reinforcement learning we are not aware of the output. Reinforcement is behavior-based learning where the outcome will be in reward punishment system. If the result is in our favor then we conclude that it is a positive reward but if it is not then we say the output is a negative reward. In other words,

the positive reward will be considered as reward and negative reward will be punishment.There are certain components of reinforcement learning[13] which are described below:

- 1. Agent: Who so ever is performing the task will be considered as agent.
- 2. Environment: The circumstances in which the agent is performing the task.
- 3. State: The condition of the agent at the time of task.
- 4. Action: The task which is being performed.
- 5. Reward: The outcome whether favorable or not.

Briefing the above 5 components with the help of an example- Let the agent be an automatic car. The road on which is being drive is mostly bumpy. Here the environment is indicated by the bumpy road. At first the car is moving fast and then it is moving slowly. Moving of car will be the action of the car. Now imagine if the car halts in between then the stopping of car at a particular moment will be the state of the car. If there is a red light somewhere and the car stops at the red light before the crossing, it then this will be considered as the reward. Project mainly implied reinforcement learning as the technique to create the BOT. Referred below is the policies[14] which we have used to train our bot:

- 1. *5 min *BUY *Entry – close, crosses above, opening Range (High, 30 min) And *RSI (14), higher than, 60 *1:3

EXPLANATION: Time interval of candlestick is equal to 5 minute in which we can either buy or sell. Here we are buying. Entry point will be when the value of RSI will be 60 or more. Period of RSI is 30 min and 14 periods. Finally the profit ratio considered here is 1 : 3. Similarly, the next three policies can be studied on the basis of above explanation. There are more policies incorporated but these were the major 4 out of them.

- 2. *15 min *SELL *Entry – close, lower than, parabolic SAR (0.02, 0.2, 0) And *0.5:1.5
- 3. *0.5 min *SELL *Entry – close, lower than, parabolic SAR (0.02, 0.2, 0) And *1:3
- 4.*15 min *Sell *close, lower than, parabolic SAR (0.01, 0.2, 0) *1:3
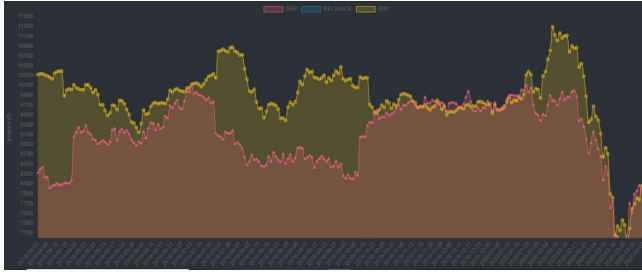
D. Zerodha API

Our bot uses Zerodha API for fetching live data to analyze the stocks. The data is fetched for every second in the live market. Automatic exchanging and record access we can utilize Kite Connect APIs[5] to put in and oversee genuine requests across different portions, pull your positions and possessions, dissect live market costs, and considerably more. It is intended for engineers who need to exchange automatically without being bound to an exchanging stage UI.

The APIs are easy to comprehend, REST-like HTTP/JSON APIs that you can use with your any programming language, or even only the order line. The URL that gives us some information or to some undertaking after sending a HTTP demand is called a Programming interface.

```
dependencies {
    implementation fileTree(dir: "libs", include: ["*.jar"])
    implementation 'androidx.appcompat:appcompat:1.2.0'
    implementation 'androidx.constraintlayout:constraintlayout:2.0.1'
    testImplementation 'junit:junit:4.12'
    androidTestImplementation 'androidx.test.ext:junit:1.1.2'
    androidTestImplementation 'androidx.test.espresso:espresso-core:3.3.0'

    //these two lines are added
    implementation 'com.squareup.retrofit2:retrofit:2.7.2'
    implementation 'com.squareup.retrofit2:converter-gson:2.7.2'
}
```
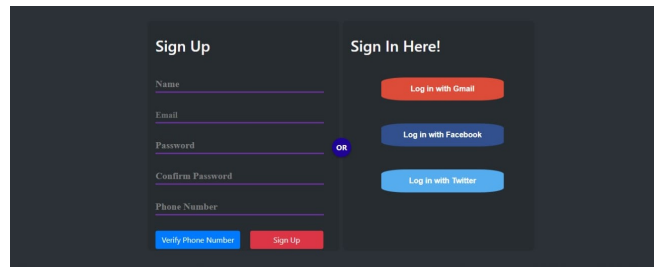
IV. RESULT

To settle on a Programming interface decision utilizing retrofit we need a java interface where we characterize all the URLs with the http demand type and boundaries. In this model we have to play out a http GET with no additional boundaries.

So,let's make a java interface inside and name it Api.java (You can name it anything you want).As you can see we have a basic interface above. Inside the interface first we have a BASE-URL. It contains the ROOT URL of our Programming interface. For any undertaking we make a Programming interface like myproject/programming interface/v1/apiname.

Retrofit isolates it in two sections the initial segment is the base URL and afterward the programming interface name. So, in our model wonder is the programming interface name and before it we have the BASE URL.

After the base URL we have an explanation @GET("marvel"). It implies that we are characterizing a http GET demand. Also, the String passed inside the get is the programming interface name. So, for this GET it will make the total URL joining the BASE-URL and the programming interface name.

At that point we have a technique named getHeroes() whose return type is Call. Furthermore, the kind of the Call is a List¡¿. Also, sort of the Rundown is Legend. It might sounds confounding however it isn't. In reality we have to structure the programming interface call agreeing the reaction. So, our URL is giving us a json cluster and that is only elite of saints. So, we characterized the Call type as a Rundown and theRundown type as Legend. Presently we have to characterize the Saint class.

V. CONCLUSION

Our group effectively built up a bot that would deal with the stock exchanging measure. This bot, with the assistance of assessment investigation will experience various discussions and locales to check for any changes in the market as referenced before and will cautiously contribute on just those which give at any rate 1 percent return. The information will be extricated from the ZerodhaApi which is one of the main stock exchanging applications. This information base will give a huge pool of data to the bot which will eventually

explore it through the stock exchanging measure.

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