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Homework 2 – Individual Project Proposal

Algorithmic Trading Bot

1)
I would like to develop an algorithmic trading bot. There are swaths of information available online covering this topic. According to the information that I have come across, there are three primary stages that I must implement. I would like to use Python over C++ for my individual project because C++ trading bots were designed for low latency high frequency trading. C++ trades speed for functionality. I would like to incorporate a variety of libraries from Python such as Pandas, NumPy, and SciPy to assist in the generation of my trading strategy formula (Heavy math base).

The first stage would be access to financial data so that I may perform data analysis on it (Yahoo Finance, Google Finance, etc…) The form of financial data could be received from numerous sources as many API's are available. I will likely select the best (data fitting trading strategy) free one, but I might be willing to pay for an API that is affordable if it allows for a great decrease in latency or more calls / second..

The second stage would be to perform data analysis on the current portfolio (if it exists). The algorithm should also parse all stocks present in the imported data from stage 1. The algorithm will perform analysis on the stock data according to the preferred trading strategy (To be determined… ideas include: scalping and swing trades) and create an array of good potential investments name investIn. If time allows, I would also like to import data such as sentiment analysis (ideally from Stocktwits but after some research I do not believe they allow it to the public. I will continue to research the possible options). While this data is not necessarily crucial; it could aid in the decision between stocks given an account with limited capital. I believe the algorithm needs a sort of ranking system that estimates the potential returns which will be accessed upon analyzing all stocks. Array investIn will be a sorted array (or other data structure that works better) with the best potential stock to invest in at index 0 and the least best stock to invest in would be at index len(investIn)-1. This bot will NOT be a High Frequency Trading bot because I do not believe that I will have the latency to be competitive. A sector identification function might be utilized if this information is not available in any API. Sector identification could be useful for a trading bot to limit the bots trading scope when certain sectors are in economic downturn (example: natural gas & oil) but this also depends on the decided trading strategy because as Warren Buffet has stated, "Be fearful when others are greedy and greedy when others are fearful". TO CLARIFY. This is a theoretical algorithmic trading bot. Real trades will not be made (although it is possible to implement) and real money will not be used. This tool is designed for educational purposes only.

The third stage will account for a dummy trade. The portfolio will be theoretically impacted and theoretical trades will be implemented. Data such as ticker symbol, number of shares, average price, buy time, sell time will be accounted for. This information will be displayed in a theoretical portfolio history and kept track of in total returns.

2)
I plan on using Python as the programming language for (Libraries: mathplotlib, pandas, numpy, maybe scipy, and maybe others..) I am comfortable using Python (pandas and numpy) as I have not only used this programming language at CU but also in the industry at Two Internships. I have do however have limited knowledge with API's (I have used Firebase API for swift in mobile application development but I do not have extensive experience using API's in Python. However, I do believe that I can locate/learn/implement a solution regardless of that limited exposure. I am completely familiar with financial markets and I am an active trader. I have dabbled with Python trading bots through Quantopian but this platform does not implicitly require an API.

3)
My project won't work if it doesn't have current financial data
(I do not have backup plan for obtaining current financial data because there are numerous sources from which it is available free/paid). This data is essential to determine whether or not a trade should be made and how good of a trade it is.

My project won't work if it doesn't have historical financial data.
(I do not have backup plan for obtaining historical financial data because there are numerous sources from which it is available free/paid). This data is essential to determine whether or not a trade should be made and how good of a trade it is.

My project won't work if it doesn't have access to a broker.
If I am unable to access my Robinhood broker. I can pivot the application to other brokerage firms and/or crypto exchanges. Access to the broker/exchange is essential to commit trades.

My project won't work if it doesn't have access to the internet
Without internet I would be unable to access up-to-date information nor would I be able to trade. I plan to have an internet connection. No backup plan here.

My project won't work if it doesn't have a trading strategy.
Any trading strategy will do but that doesn't necessarily ensure profits. I will be continueing research on this topic but some potential strategies might include (stock comparison trading: Stock A and B are directly related. When stock A goes up, stock B goes up. One strategy could account for differences in the relationship between stock A and stock B and invest in any discrepancies. Another strategy could include fundamental analysis (highs/lows, relative highs/relative lows, volume, direction/momentum). Another potential investment strategy could be scalping (Scalping is a trading strategy in which traders profit off small price changes for a stock. Maybe attempt to evaluate oversold positions on stocks to catch a 1-3% rebound day trade).

My project won't work if it doesn't have any capital to trade.
I currently possess capital in my Robinhood account so no backup plan is necessary.

4)
Outside resources include API calls to Finnhub (https://finnhub.io/) which is FREE. Requests are limited to 1 per second. This information should be current enough. I can simplify requests pertaining to specific tickers if desired rather than all tickers.

5)
Backend will be Mysql. Connection could be established through potential method such as PyMySQL import. I believe that I will attempt to create a front end GUI through PyQT which runs on my computer. If I am unsuccessful in my attempts at creating a GUI, I can implement the program into an iOS application in which I am familiar building (x-code, mobile application development experience).

User interface Options:
Start Trading, Stop Trading, Show portfolio, Show history, (maybe avoid X investment sector, or focus on sector X), and possibly more

I plan on having a stocks class with objects relating to each stock. A portfolio class will inherit information from the stocks class. A Historical class will inherit from the portfolio class. Objects will be displayed underneath ‘History’ in the GUI/front end. Current portfolio could be listed above ‘History” maybe underneath “My Investments”.

Design Pattern:
Factory Method, creating an instance of multiple derived classes.

Main

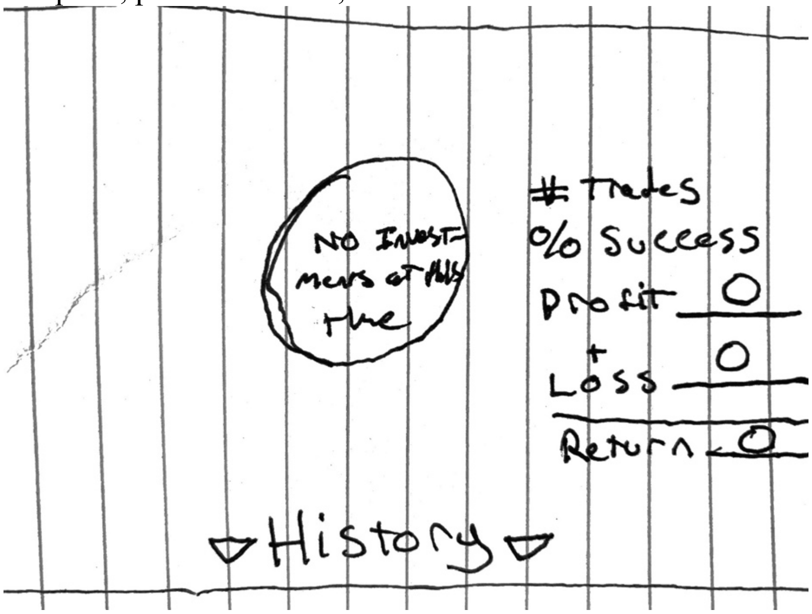
Scan Portfolio History

B)
- Users
  - User10234123’s Identifier
    - Portfolio Value
    - Owned
      - (stock ticker symbol)
        - Price
    - Watching
      - Price

6)
GUI: could display a chart displaying your current portfolio. Next to it could be a display of earnings since launching the bot. Underneath it could be a trading history for the account with its buy in and sell out prices and profit gained or lost in both value (example: $3.42) and percentage (example: 1.45%).

GUI:

Circle is Pie chart that says (no investments at this time). Will adjust according to portfolio. When history is clicked, you can see every trade in a listed format. Displaying ticker, buy price, sell price, price difference, difference in %



7)

i) Homework 2, Part 3 - February

-Create generic Python program to and import to github

ii) Homework 3 - March 13th

-connect to finnhub api. Develop a trading strategy to implement and return a sorted list of potential investments. Finalize Investment strategy. User can return a list of potential trades

Learn best investment strategy

iii) Homework 4 - April 3rd

-Really hone in and improve the trading strategy (optimization) and sort the potential investments to a return list of best investment to the least best investment. Determine exit strategies for investments.

User will begin to see theoretical placed trading in trading history after exit strategy is determined.

iv) Homework 5, checkpoint - April 17th

-Create GUI/front end

User can interact with the Python GUI!

Learn PyQT

v) Homework 5, final due date - April 29th

Having fully functional GUI/front end correctly communicating with the program! The user will be able to execute the program to initiate theoretical trades which will be recorded.

Learn how to relate a GUI to a Python program

8)
I plan to stay engaged in the course through participation and activity. I still plan on attending lecture and keeping up with PE and lecture assignments. I plan to proactively meet project deadlines. Other forms of engagement include analyzing and executing code demonstrated in lecture on my own machine. I would still develop the PE and lecture assignments in C++ even though I am requesting to use Python for my individual project.

Github Link: https://github.com/techLord-pm/PPWProject/tree/master