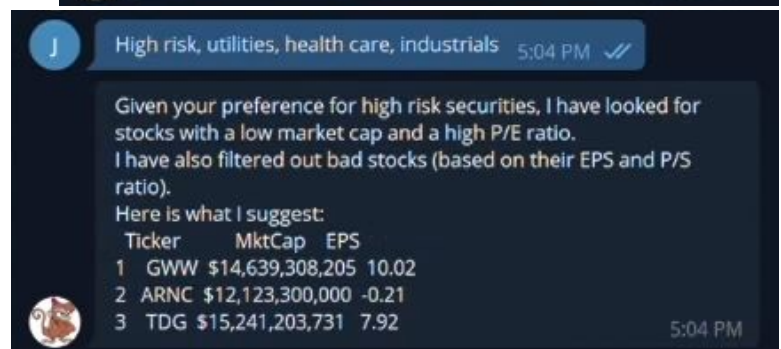
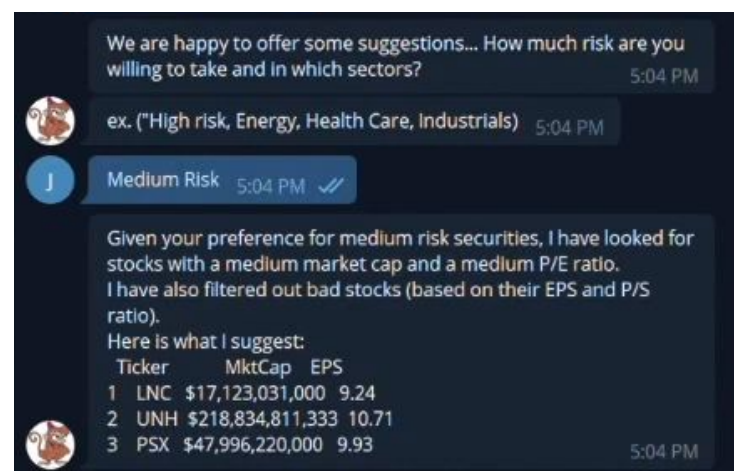


At a high level, Abu is a financial chatbot that leverages BlackRock's Aladdin API and the AlphaVantage API to give users relevant financial data related to their portfolio and the market as a whole. Abu is able to maintain a human-like conversation with either complete sentences, quick phrases, or simple keyword searches. Together, this all makes it easy for users to see how their portfolio is doing, explore the market, or ask for suggested securities. What follows is a quick demonstration of how this functionality works.

## Suggestions

Most impressively, we can ask Abu to suggest securities in which we should consider investing. Abu will ask us for our preferred level of risk (low, medium, or high) and in which sectors we prefer to invest. We can specify any number of sectors, or none at all to search every sector. Abu will then give us three suggested securities using the following algorithm:

1. We first assemble a bank of all securities to consider. We picked out four popular ETFs for each sector and three general ETFs, and then added every stock in the S&P 500.
2. To determine stocks' riskiness, we segment the data into four lists:
  - a. Two lists split stocks into the top and bottom halves of market cap, and
  - b. Two lists split stocks into the top and bottom halves of the Price-to-Earnings ratio, where a non-positive P/E ratio is considered high.
3. Securities are divided into low-, medium-, and high-risk lists by the following criteria:
  - a. A security is low-risk if it is a fund or if it is in both the top half of market caps and the bottom half of P/E ratios.
  - b. A security is high-risk if it is in both the bottom half of market caps and the top half of P/E ratios.
  - c. Medium-risk securities are those which are not low- or high-risk.
4. We then build a list of "good" stocks, which are defined as those in the top half of Earnings Per Share ratios and/or the bottom half of Price-to-Sales ratios. A random number determines whether

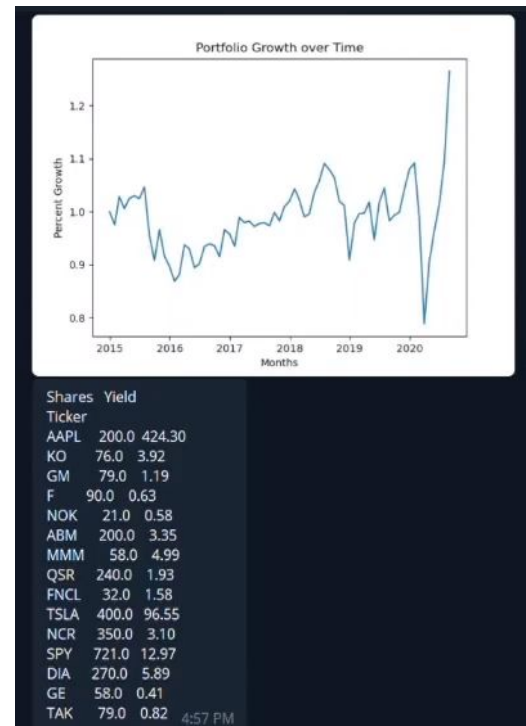


a stock must meet one or both of these criteria to be deemed good (thus increasing the variance of our suggestions).

5. A list of possible securities is compiled based on the user's preferred sectors and desired risk. Only stocks deemed good are included in this list.
6. Finally, a random selection of three possible securities is then given to the user. (Due to time constraints, we could not implement machine learning into the suggestion model, but that would certainly be an area for growth with more time.)

## Portfolio Breakdown and Performance

Asking Abu to summarize our portfolio displays a graph of our portfolio's yield over time, followed by a table that details our holdings and yield for each security in our portfolio. The graph will depict up to two hundred weeks of historical data (less if, for example, one security in the portfolio was incepted within the past two hundred weeks).



To take a deeper dive into our portfolio, we can ask Abu to list our top and bottom performing securities (by total yield). Abu will also sort our sectors from best to worst weighted yield for each sector represented in our portfolio (funds are treated as their own sector). The weighted yield calculation accounts for relative differences in the number of securities we have of stocks within a sector. For example, Ford (F) and Tesla (TSLA) are both in the Consumer Discretionary sector, but we have more shares of Tesla, so the weighted yield of this sector will be skewed more towards Tesla's higher yield.

Would you like to search a particular asset, see top performers, or view your portfolio classified? 4:57 PM

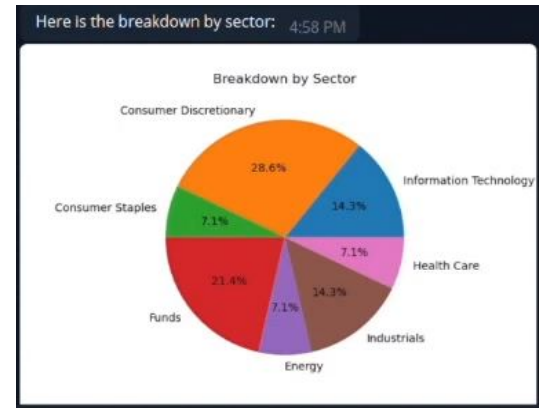
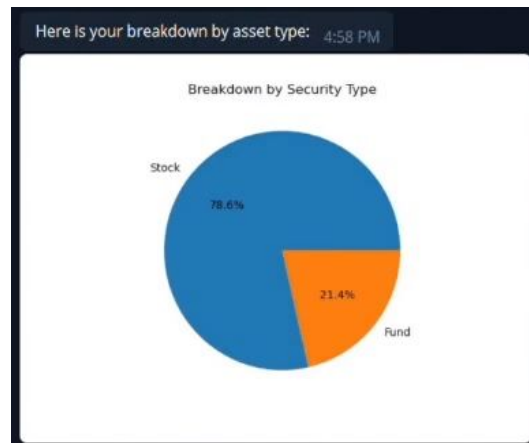
J Show me my top performers 4:58 PM ✓

Your top performers:  
TSLA, total yield: 96.547  
AAPL, total yield: 424.305

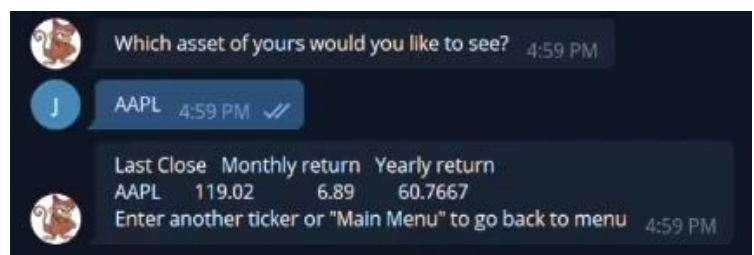
Your bottom performers:  
GE, total yield: 0.414

Your top performing sectors:  
Information Technology, weighted yield: 150.542  
Consumer Discretionary, weighted yield: 48.495  
Funds, weighted yield: 10.746  
Consumer Staples, weighted yield: 3.919  
Industrials, weighted yield: 3.111  
Health Care, weighted yield: 0.820 4:58 PM

Abu can also give us a visual breakdown of our portfolio, sorting holdings by security type (stock vs. fund) and by sector (funds are treated as their own sector).



Along with our portfolio as a whole, we can also ask Abu for more information about an individual security in our portfolio and Abu will tell us the last close price as well as the monthly and yearly yields of that security.



## Exploring the Market

To get more details on any security in the market, we can ask Abu how it's doing and we'll get a graph depicting its yield over time. The graph will go as far back as the security's inception date (unless that was before 2002 since the Aladdin API's data does not go further back than that).



Alternatively, we can take a peek at various sectors in the market, and Abu will give us the five largest stocks in that sector (by market cap).

