DESIS ASCEND EDUCARE

FINAL PROJECT

Portfolio Management WebApp

Contents

Summary

The portfolio management application is a comprehensive platform that facilitates investment tracking and performance monitoring for users. The application offers a user-friendly interface, which displays the user's holdings, transactions, and performance metrics. The key requirements include a secure login system, a user-friendly interface, and compatibility with diverse investment types such as stocks, bonds, and mutual funds. We have also developed an analysis component on Google Collab, which displays historical data on specific stocks, various analytic parameters, and overall trends via line graphs.

The high-level design of the app comprises a database to store user information and transaction data, a front-end interface to display the user's holdings and performance metrics, and an API to connect the two. This portfolio management app provides a holistic view of the user's investment portfolio, empowering them to make informed decisions about their financial future.

The future endeavors associated with the application include integrating analysis of specific stocks with our web app and expanding the range of investment types supported, integrating advanced analytics and reporting, and collaborating with third-party investment tools.

Motivation

Finance and investing have always been domains that our group was fascinated and curious about. We saw an opportunity to create a tool that would help people manage their investments more effectively. We wanted to develop an application that would provide users with the information they need to make informed investment decisions.

One of the key differences that sets this project apart from other portfolio web applications is its focus on data analysis and risk management. The application includes an analysis component that utilizes historical data of stocks to calculate key financial parameters such

as variance, standard deviation, covariance, correlation, and beta, and provide insights into the risk of investment.

Another difference is the level of customization and flexibility offered by the application. Users can customize their portfolios based on their investment preferences and goals, and can track their performance over time using a variety of metrics and analytics.

Overall, this project offers a unique combination of user-friendly design, advanced data analysis capabilities, and customization options that sets it apart from other portfolio web applications available online.

Requirements

The requirement analysis for the portfolio management application brought up the following features into light:

1. **User authentication:** A secure login system to ensure the privacy and security of user information.
2. **User-friendly interface:** A user-friendly interface with intuitive navigation and easy-to-use tools to manage and track the user's investment portfolio.
3. **Real-time data updates:** The app should provide real-time updates on stock prices, market trends, and other important data to help users make informed investment decisions.
4. **Compatibility with different investment types:** The app should be able to handle different types of investments such as stocks, bonds, mutual funds, and ETFs.
5. **Transaction tracking:** The app should track all transactions made by the user, including all buys, and sells.
6. **Performance metrics:** The app should provide performance metrics such as return on investment (ROI), profit and loss (P&L), and other key performance indicators (KPIs).

7. **Reporting and analytics:** The app should provide comprehensive reporting and analytics features to help users track their portfolio performance over time and identify trends and patterns.
8. **Third-party integration:** The app should be able to integrate with third-party investment tools and services, such as financial advisors or tax preparation software.

Based on this requirement analysis, we have tried to incorporate some of the features into this project. In the project's future scope, we aim to extend the web app to include real-time data updates, reporting and analytics, and third-party integration into it.

Tech Stack

Python: We used Python, a high-level programming language, for data analysis and backend development. Python is widely used for data analysis and provides a rich set of libraries and tools, such as NumPy, Pandas, and Matplotlib, which are well-suited for analyzing financial data.

Django: We selected Django as the web framework for this project because it is a robust and mature framework that offers a lot of functionality out of the box. Django also has a lot of community support, which means that there are many plugins and libraries available for it. In addition, Django is based on Python, which is the language we used for the analysis part of the project. By using Django for the web framework and Python for the analysis part, we were able to integrate the two seamlessly and create a web application that was both user-friendly and provided insightful analytics.

MySQL: It is a relational database management system that is used to store and retrieve structured data. MySQL is a widely used open-source relational database management system that provides scalability, reliability, and security.

HTML: To develop the web app pages, HTML has been used. This is because of several reasons. HTML provides a clear and concise way to structure and format content, making it easy for both humans and machines to understand. It is a flexible language that can be used to create a wide range of web pages, from simple static sites to complex dynamic applications. Additionally, HTML is supported by all major web browsers, ensuring that our website will be accessible to a broad audience. Finally, by separating content from presentation, HTML allows for easy maintenance and updates to web pages, which can save time and resources in the long run.

Ipywidgets Library: To develop the analysis tool, ipywidgets library has been used. This is because the ipywidgets library allows for the creation of interactive graphical user interfaces. Some other advantages include its ease of use, flexibility, and ability to create dynamic and real-time interactive data visualizations. It is also highly customizable, enabling developers to customize the appearance and behavior of widgets to meet the project's needs. Additionally, the library is compatible with a wide range of notebook environments and can easily integrate with other Python libraries such as Matplotlib and Pandas. Overall, ipywidgets is a powerful tool that enables developers to create sophisticated, interactive visualizations and user interfaces, while also simplifying the process of creating and sharing code.

Design and Architecture

High-level design

1. Database

The app requires a database to store user information such as login credentials, personal details, and portfolio data such as holdings, transactions, and performance

metrics. The database should be designed to ensure data integrity, security, and scalability.

2. **Front-end interface**

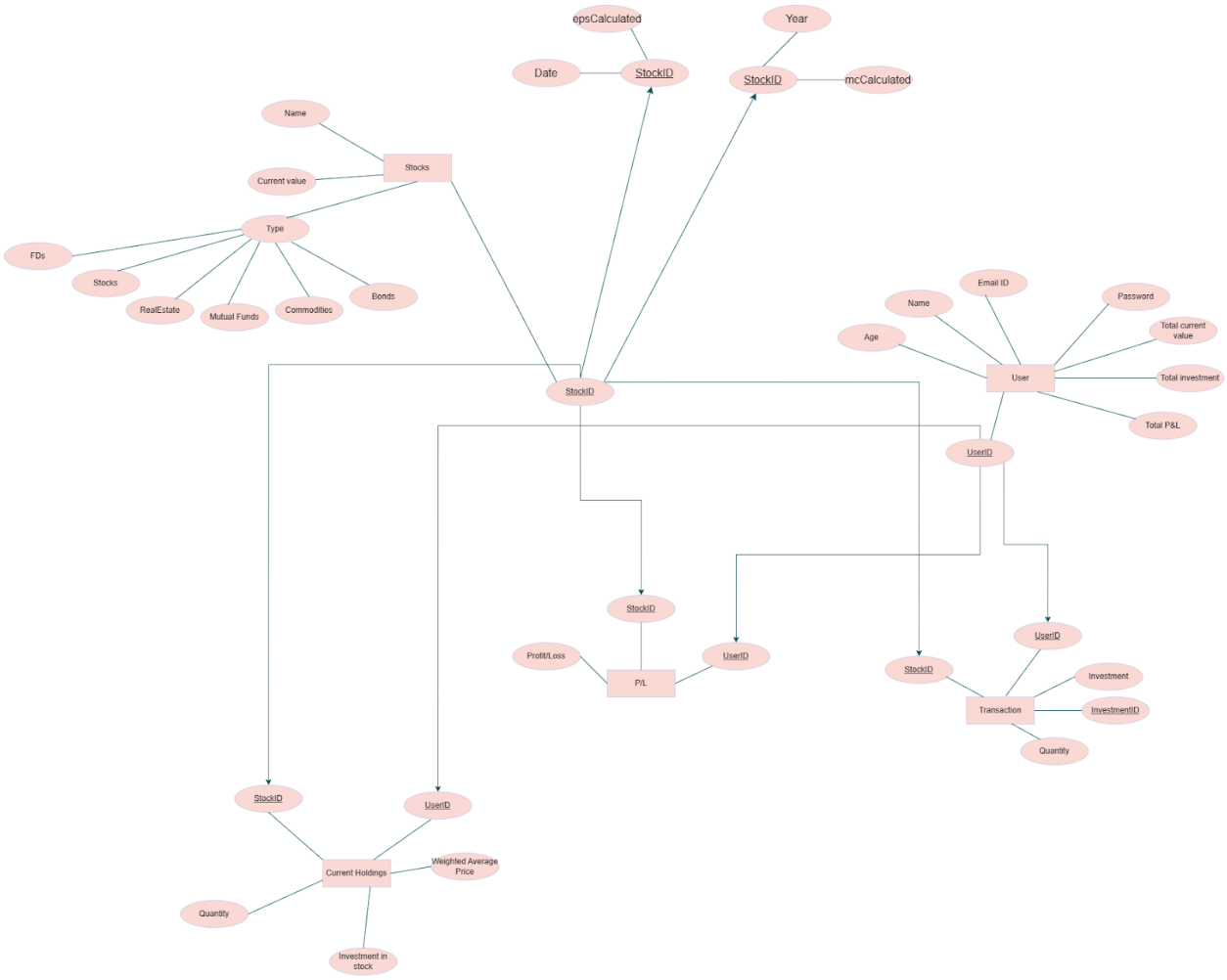
   The app should have a user-friendly interface to display portfolio data to users. This interface should allow users to view their current holdings, and track their performance. The front-end should also provide analytical insights via key parameter calculations to enable the users to efficiently track their portfolio performance over time and make informed decisions about their investments. The analytical aspect is currently supported on Google Collab.

3. **API**

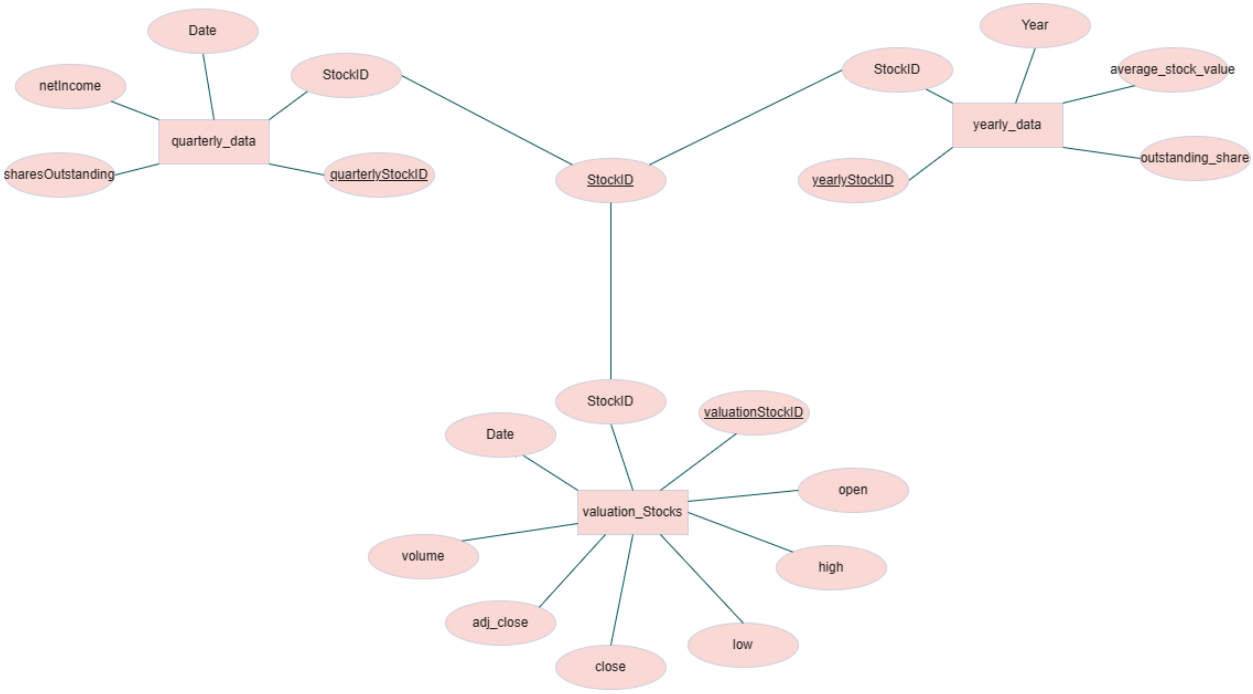
   The API connects the front-end interface to the database. This allows the front-end to display the user's portfolio data, such as holdings and performance metrics, and allows users to update their portfolio information into the database by making requests to the API.

Together, these components work together to create a functional portfolio management app that allows users to easily track their investments, make informed decisions, and manage their portfolio.

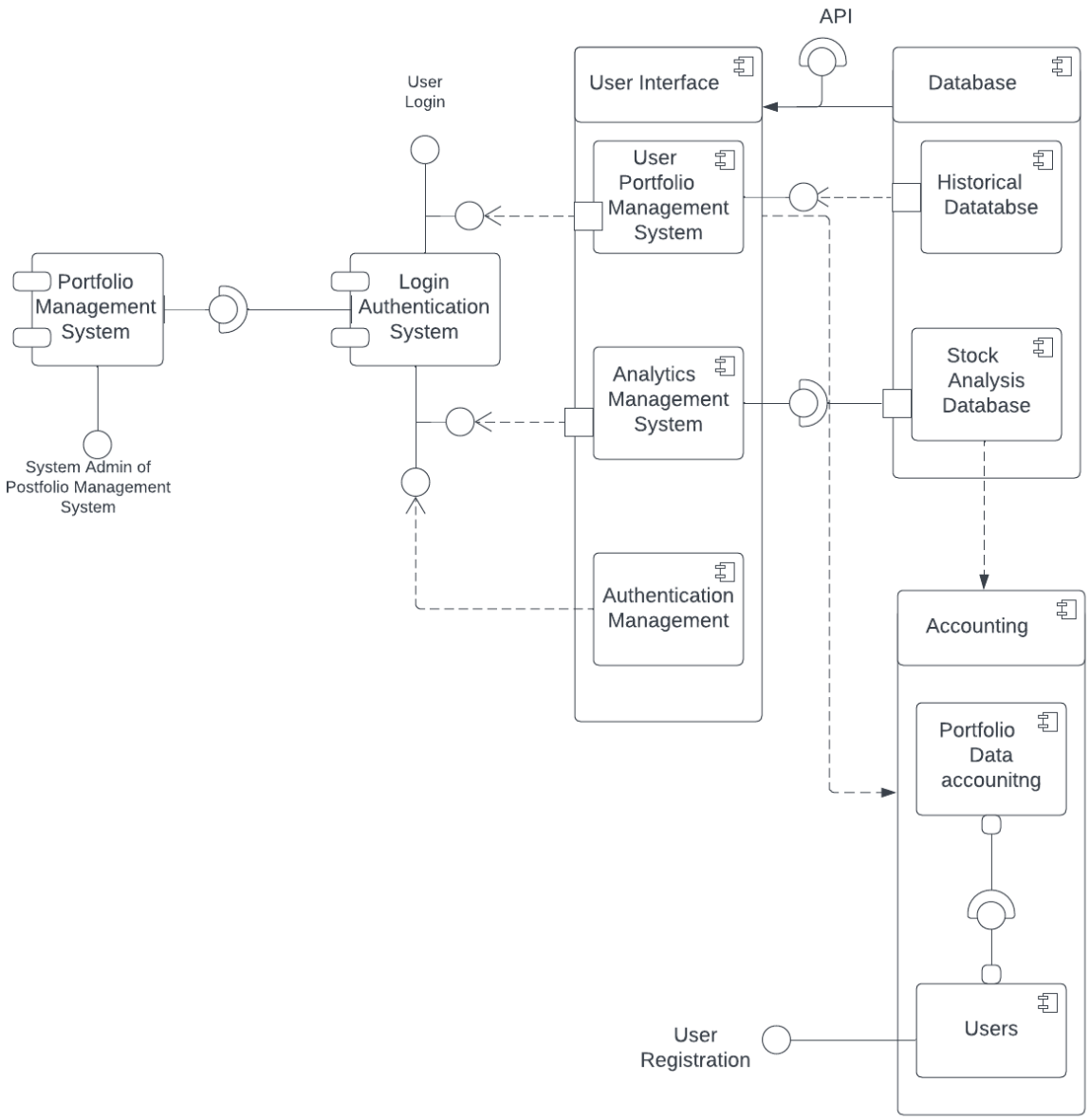
Following is the Entity-Relationship diagram of the portfolio management system.



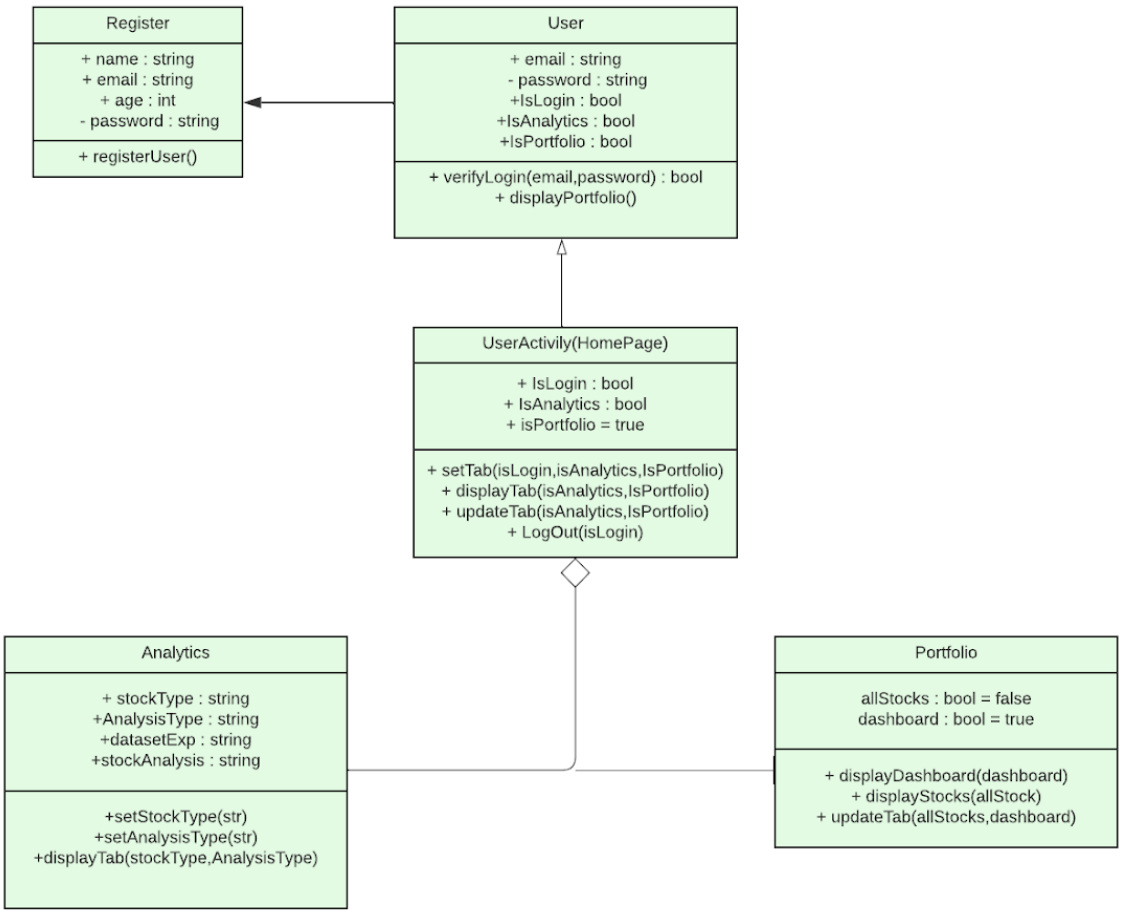
Following is the Entity-Relationship diagram of the analysis part using the historical data.



Here is the component diagram for the portfolio management system.



Follows the class diagram for the project



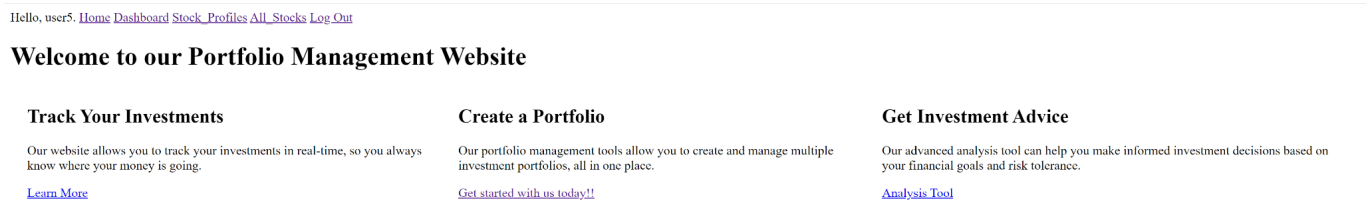
Front End Interface

The front end interface has 2 aspects: the web app, which supports portfolio management, and the Google Collab dashboard, which supports the analytical tool.

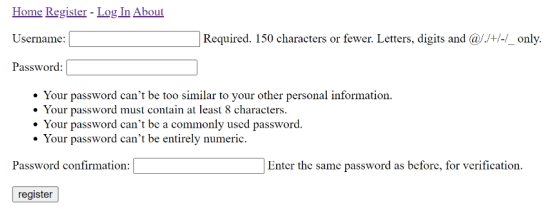
The web app's front end has been developed with the help of HTML. The Google Colab analysis tool has been developed with the help of ipywidgets library.

Here are some snapshots of the web application demonstrating the project.

- Home Page

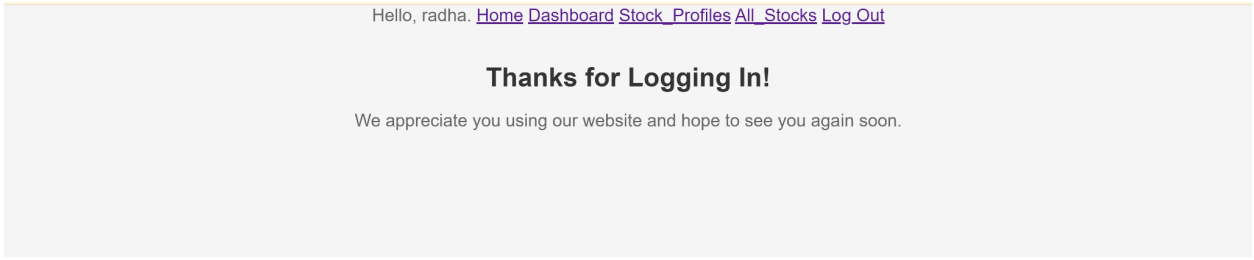


- Registration Page

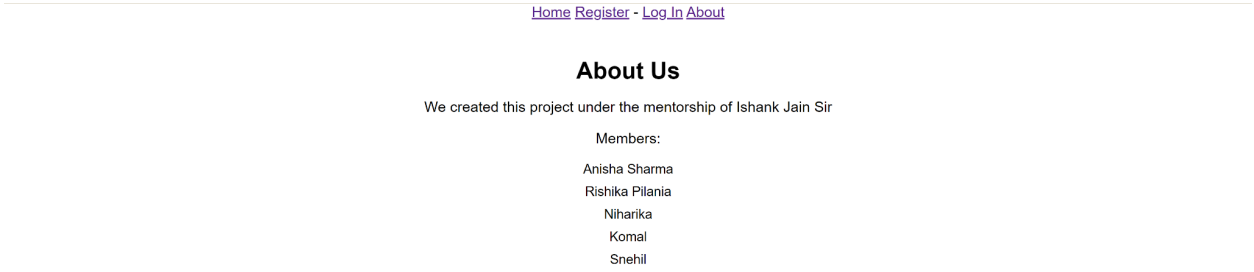


- Login Page

- Logout Page

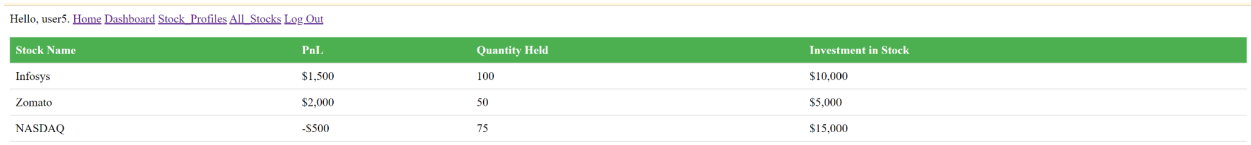


- About Us Page

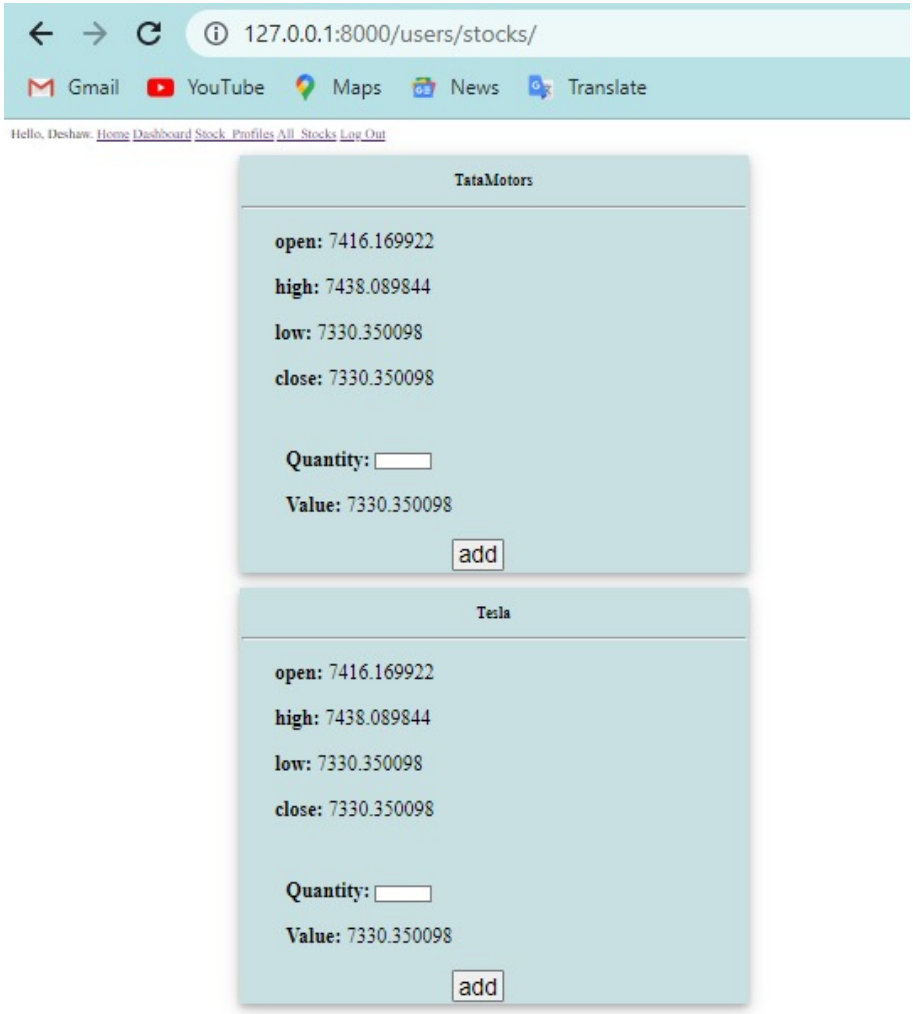


- User's Dashboard (displays the overall investment)

- Stock Profiles Page (displays each investment's details)

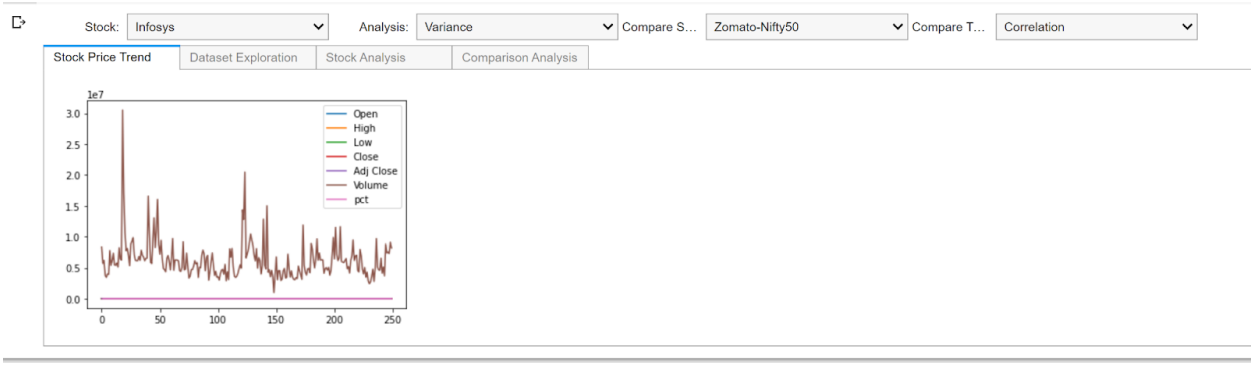


- Add Stocks Page (allows the user to add different stocks to his/her portfolio)

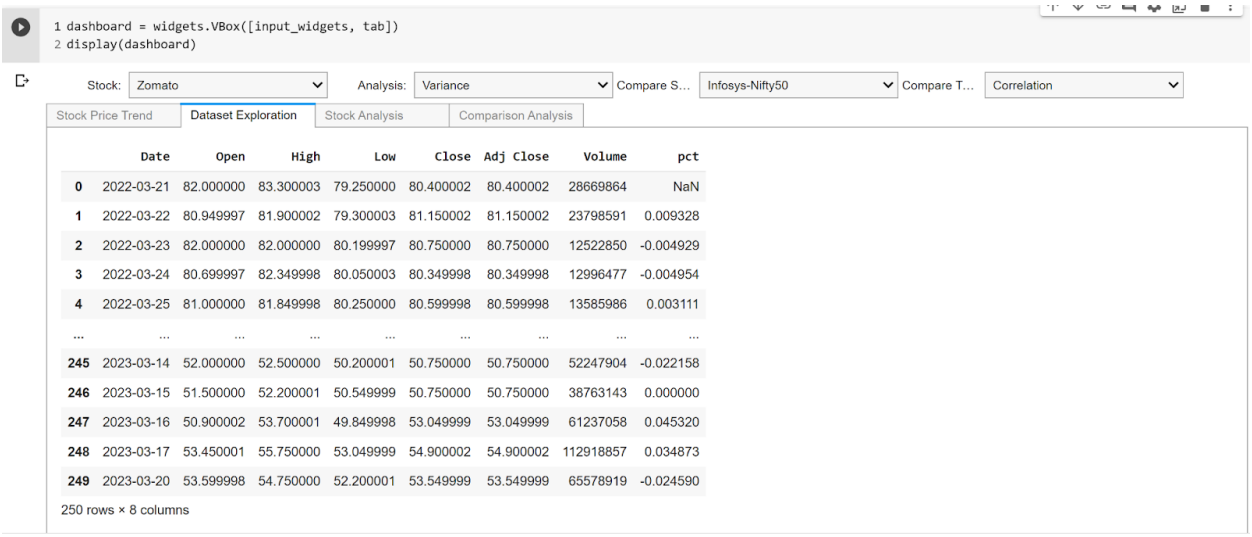


Here are some snapshots of the Google Colab demonstrating the analytical insights.

- Stock Price Trend tab (after selecting the stock from the stock dropdown, the tab displays the trend of stock prices over time)



- Dataset Exploration (allows the user to examine the historical prices)



	Date	Open	High	Low	Close	Adj Close	Volume	pct
0	2022-03-21	82.000000	83.300003	79.250000	80.400002	80.400002	28669864	NaN
1	2022-03-22	80.949997	81.900002	79.300003	81.150002	81.150002	23798591	0.009328
2	2022-03-23	82.000000	82.000000	80.199997	80.750000	80.750000	12522850	-0.004929
3	2022-03-24	80.699997	82.349998	80.050003	80.349998	80.349998	12996477	-0.004954
4	2022-03-25	81.000000	81.849998	80.250000	80.599998	80.599998	13585986	0.003111
...	...	...	...	...	...	...	...	...
245	2023-03-14	52.000000	52.500000	50.200001	50.750000	50.750000	52247904	-0.022158
246	2023-03-15	51.500000	52.200001	50.549999	50.750000	50.750000	38763143	0.000000
247	2023-03-16	50.900002	53.700001	49.849998	53.049999	53.049999	61237058	0.045320
248	2023-03-17	53.450001	55.750000	53.049999	54.900002	54.900002	112918857	0.034873
249	2023-03-20	53.599998	54.750000	52.200001	53.549999	53.549999	65578919	-0.024590

250 rows × 8 columns

- Stock Analysis Tab (after selecting the analysis parameter from the analysis dropdown, the user can view the information in the tab)

- Comparison Analysis (after selecting the compare stock and compare type from the respective dropdown menus, this tab display the requested comparison parameter for requested stock type)

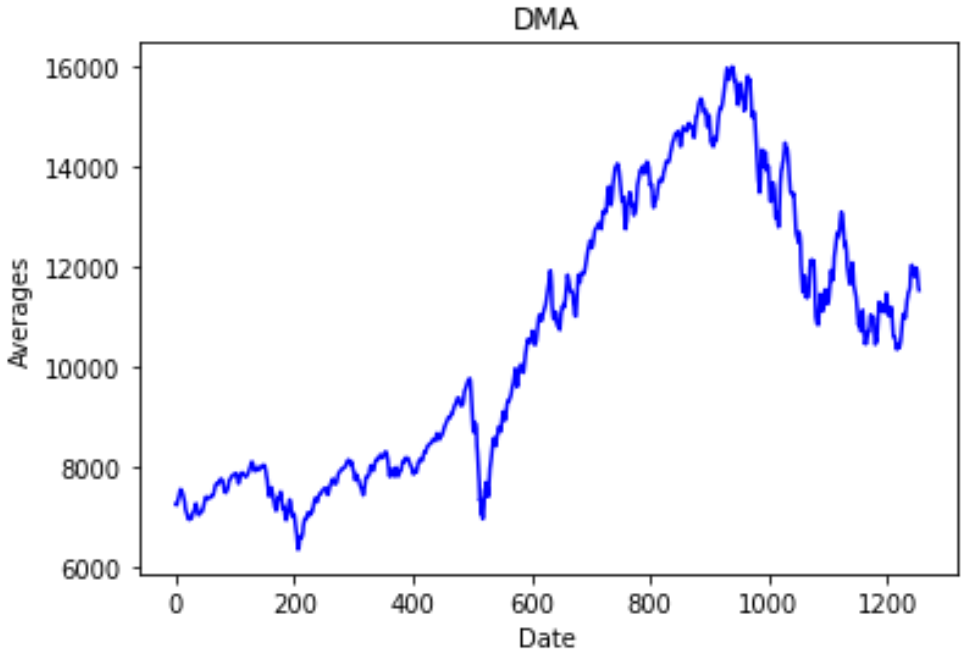
Analysis

The following parameters are used for analysis:

Daily Moving Average :

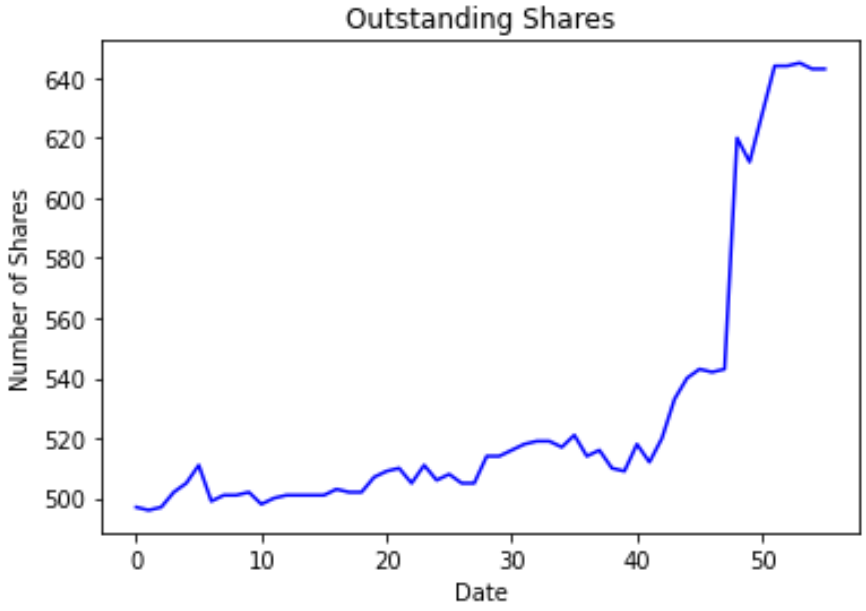
Moving averages provide pricing additional context. Moving averages are a useful method for obtaining stock price trends without the accompanying noise. Longer-term daily moving averages have the added benefit of eliminating price trend discrepancies caused by singular events. The calculation of moving averages involves adding up all the data points for a given period, then dividing that total by the number of time periods employed. Moving average indicator helps in tracking the dynamic prices of stocks more accurately. Technical chart analysts may read a stock's short-, medium-, and long-term trends using MAs to forecast the direction of the trend going forward.

$$\text{Daily Moving Average} = C_1+C_2+C_3+\ldots+C_N / N$$



Outstanding share:

In order to determine important measures for a company, including its market capitalization, profits per share (EPS), and cash flow per share, the number of outstanding shares is taken into account. The number of outstanding shares of a firm is not constant and is subject to rapid changes throughout time. Shares outstanding relate to the stock that a firm currently has, including restricted shares held by insiders and institutional investors as well as share blocks held by institutional investors. On a company's balance sheet, outstanding shares are listed under the heading "Capital Stock."



Market capitalization:

The total dollar market value of a company's outstanding shares of stock is referred to as market capitalization. The size of a corporation is determined by this number according to the investment community. The market cap is used in acquisitions to assess if a takeover candidate offers a good value to the acquirer or not. A high market cap signifies that the company has a larger presence in the market.

Market Capitalization= Current Market Price* Total Number of Shares Outstanding

Market Capitalization calculated in the colab file:

{2022: 28835.7936, 2021: 28999.928, 2020: 19096.8675, 2019: 15039.1182, 2018: 13608.664999999999, 2017: 11172.499099999999, 2016: 9866.6964, 2015: 7827.9116, 2014: 6059.0136, 2013: 4726.3841999999995, 2012: 3473.449, 2011: 3765.6899999999996, 2010: 3455.446, 2009: 3672.1524}

Earnings per share :

Earnings per share is calculated as a company's profit divided by the outstanding shares of its common stock. The resultant figure is used to gauge a company's profitability.The more profitable a corporation is deemed to be, the greater its EPS. EPS, a popular statistic for determining corporate value, shows how much money a firm produces for each share of its stock. Because investors would pay more for a firm's shares if they believe the company has larger earnings relative to its share price, a higher EPS denotes more value.

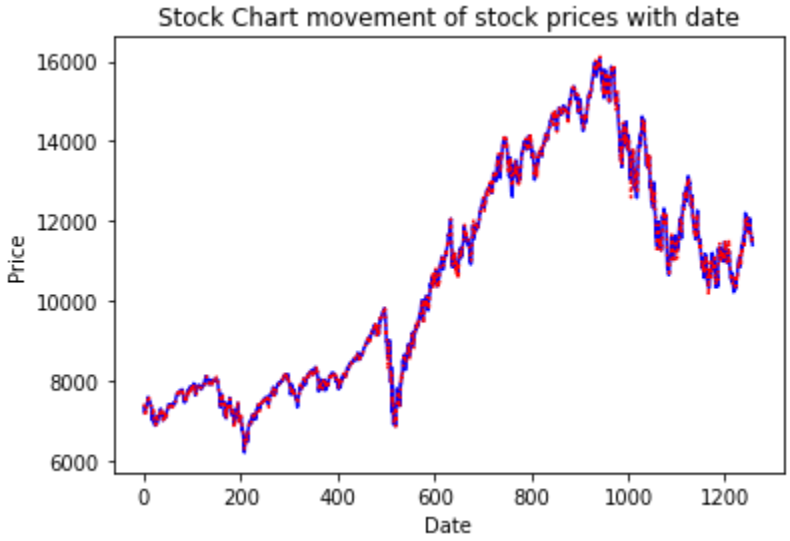
EPS=Net Profit/ Total Number of Shares Outstanding

EPS Calculated in the colab file:

{'31-12-2022': 0.48490945674044267, '30-09-2022': 0.592741935483871, '30-06-2022': 0.6177062374245473, '31-03-2022': 0.5657370517928287, '31-12-2021': 0.5148514851485149, '30-09-2021': 0.5636007827788649, '30-06-2021': 0.6833667334669339, '31-03-2021': 0.5948103792415169, '31-12-2020': 0.4491017964071856, '30-09-2020': 0.5258964143426295, '30-06-2020': 0.4839357429718876, '31-03-2020': 0.406, '31-12-2019': 0.405189620758483, '30-09-2019': 0.2994011976047904, '30-06-2019': 0.3473053892215569, '31-03-2019': 0.4930139720558882, '31-12-2018': 0.0874751491053678, '30-09-2018': 0.3247011952191235, '30-06-2018': 0.32270916334661354, '31-03-2018': 0.34911242603550297, '31-12-2017': 0.481335952848723, '30-09-2017': 0.3333333333333333, '30-06-2017': 0.2891089108910891, '31-03-2017': 0.3287671232876712, '31-12-2016': 0.44861660079051385, '30-09-2016': 0.2578740157480315, '30-06-2016': 0.13861386138613863, '31-03-2016': 0.2613861386138614, '31-12-2015': 0.28793774319066145, '30-09-2015': 0.26848249027237353, '30-06-2015': 0.25775193798449614, '31-03-2015': 0.017374517374517374, '31-12-2014': 0.1676300578034682, '30-09-2014': 0.23699421965317918, '30-06-2014': 0.195357833655706, '31-03-2014': 0.19769673704414586, '31-12-2013': 0.27626459143968873, '30-09-2013': 0.2189922480620155, '30-06-2013': 0.17254901960784313, '31-03-2013': 0.0825147347740668, '31-12-2012': 0.1640926640926641, '30-09-2012': 0.173828125, '30-06-2012': 0.17884615384615385, '31-03-2012': 0.15947467166979362, '31-12-2011': 0.15, '30-09-2011': 0.20257826887661143, '30-06-2011': 0.16974169741697417, '31-03-2011': 0.19152854511970535, '31-12-2010': 0.21935483870967742, '30-09-2010': 0.1650326797385621, '30-06-2010': 0.15286624203821655, '31-03-2010': 0.09472049689440994, '31-12-2009': 0.06677018633540373, '30-09-2009': 0.09302325581395349, '30-06-2009': 0.10730948678071539, '31-03-2009': 0.14618973561430793}

Stock Chart (Movement of stock prices with time):

Chart patterns are used by traders to spot stock price trends and trading opportunities. Some patterns advise traders to buy, while others advise them to sell or maintain their positions.



The risk of investment was analyzed for each stock using various financial parameters that included:

- **Variance:** Variance is a measurement of the degree of risk in an investment. Risk reflects the chance that an investment's actual return, or its gain or loss over a specific period, is higher or lower than expected.

  Low variability is ideal because it means that you can better predict information about the population based on sample data. High variability means that the values are less consistent, so it's harder to make predictions.

- **Standard Deviation:** Standard deviation is the statistical measure of market volatility, measuring how widely prices are dispersed from the average price. If prices trade in a narrow trading range, the standard deviation will return a low value that indicates low volatility.

  When prices move wildly, standard deviation is high, meaning an investment will be risky. Low standard deviation means prices are calm, so investments come with low risk.

- **Covariance:** It measures whether stocks move in the same direction (a positive covariance) or in opposite directions (a negative covariance). When constructing a portfolio, a portfolio manager will select stocks that work well together, which usually means these stocks' returns would not move in the same direction.

- **Correlation:** Correlation shows the strength of a relationship between two variables and is expressed numerically by the correlation coefficient. The correlation coefficient's values range between -1.0 and 1.0.

  A perfect positive correlation means that the correlation coefficient is exactly 1. This implies that as one security moves, either up or down, the other security moves in lockstep, in the same direction. A perfect negative correlation means that two assets move in opposite directions, while a zero correlation implies no linear relationship at all.

- **Beta:** Beta is a measure used in fundamental analysis to determine the volatility of an asset or portfolio in relation to the overall market.

  A stock that swings more than the market over time has a beta greater than 1.0. If a stock moves less than the market, the stock's beta is less than 1.0. High-beta stocks tend to be riskier but provide the potential for higher returns. Low-beta stocks pose less risk but typically yield lower returns.

Future Scope

The future endeavors associated with the project include expansion in terms of adding real time updated data, enhanced portfolio analysis tools, integration with third-party tools for direct access to the investment details, and even making investments from this platform, adding education content, and a lot more.

- **Enhancing portfolio analysis tools and integrating it with web app:**

  The application can be improved in terms that it could provide more detailed analysis of portfolio risk and diversification, or offer suggestions for rebalancing based on a user's risk tolerance and investment goals. This all details can be displayed on web app enabling user to visualize various stocks more efficiently on one platform instead of having analysis part on collab.

- **Adding more investment options:**

  The app could expand the range of investment options available to users. For example, if the app currently only supports stocks and bonds, it could add mutual funds, ETFs, and other types of investments. This would increase the app's usefulness to a wider range of investors.

- **Third-party integration:**

  Third-party integration in a portfolio management system refers to the ability of the system to connect with external services or applications provided by third-party vendors. By integrating with third-party services, a portfolio management system can provide users with more comprehensive and accurate data, streamline the investment process, and automate certain tasks. This can include services such as online brokers, banks, accounting software, market data providers, and more.

- **Real-time updated data**

Real-time updates would allow investors to see the most up-to-date information on their holdings, including current prices, market news, and any changes in market conditions. This would enable investors to make more informed decisions about their portfolios and react quickly to any changes in the market.

- **Integrating educational content:**

  The application could have educational content to help users learn more about investing and portfolio management. This could include articles, videos, or interactive tools that teach users about key investing concepts such as asset allocation, risk management, and portfolio optimization.

References

1. Data collection for the analysis
    a. Yahoo Finance
    b. Macrotrends
    c. Investopedia

Contributors

1. Ishank Jain (Mentor)
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