Stock Market Notifications System (Email, SMS and Telegram)

Data Visualization Project 2023

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1. Introduction

The Stock market is a platform where stocks and other securities are bought and sold. It is a key part of the global financial system and serves as a mechanism for companies to raise capital.

The main aim behind this project was to develop a simple but interactive dashboard based on Data Visualization Techniques and concepts studied in class. We obtained our dataset from Nasdaq- Stock screener. So, in effect we looked to create a dashboard that would send notification to the user with respect to the changes in the Stock market. The case study was based on Technology sector that floated shares in over fourteen countries, some of which are: Apple Inc, Zoom Video Communication, and Microsoft, just to mention but a few.

1.1. Dataset Description

The dataset has 11 columns and 117 rows, with data collected from 1980 through to 2021, thus the IPO year of the various technological companies. Just like any other data set, our dataset had several inconsistences that were rectified. The dataset has 5 categorical data and 6 numerical data. Some significant variables in our datasets were, the country in which the shares were floated, the names of companies that floated the shares, and the market capitalization. Others are the company's net change, and the industry in which the company's belong.

The table below shows the variables and their semantics;

Variables	Semantics
Symbols	Letters representing the names of the companies
Name	Refers to the names of the technological companies
Last Sale	Last sales made by the company
Net Change	The difference between a prior trading period's closing price and the current trading period's closing price for a given security
Percentage Change	This is the metric that compares a stock price at one point in time to the price at a different point in time
Market Cap	Total value of all the company's shares of stock
Country	Country in which the shares were floated
IPO Year	Refers to the Initial Public Offer

Volume	The total number of shares that have been bought or sold in the market
Sector	Refers to the part of the ecomony in which this industries operate
Industry	A group of companies that operate in similar business sphere

1.2. Inpiration

Our inspiration for creating this dashboard came from the fact that, we wanted to monitor our investments, thus, the stock market dashboard is a useful tool for tracking the performance of our portfolio. By creating a dashboard that displays key metrics, you can gain a better understanding of your investments and make more informed decisions.

The world is changing and while the world economies keep on growing. People especially youths and students struggle to pay their bills. As students we wanted to have at least a passive income and because we are working towards our goal to become data scientists we thought it would be much better to invest in stock market mainly tech stocks. Is there any problem with that? Definitely no but this game requires time and so we came out with a notification system which will help us to only focus on the investing/trading strategy.

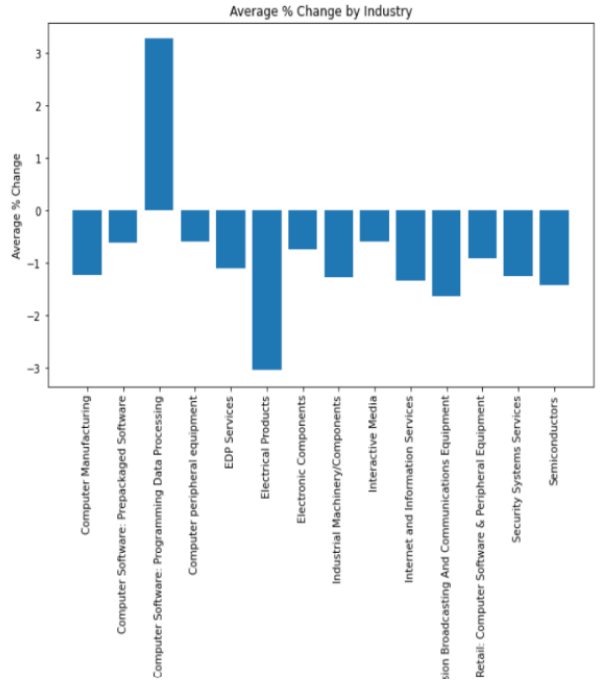
2. Data and Method

2.1. Visualization and Interaction

In our attempt to create a dashboard that can provide information about the stock market with the aim of guiding the users on their decision making regard of when to buy shares floated by the companies, we developed five visualization charts, three of which are interactive.

We created two bar charts, one of which we compared the industry in which the companies belong to with the average percentage change of their performance on the stock market. The chart will reveal to any user the measure of relative change in the value of a stock over the period of time. Hence, the user is able to compare at a glance whether there was a positive or negative average percentage change in the stocks floated by the companies in those industries. As can be seen in figure 1, the only industry with a positive average percentage change was 'Computer Software Programming Data Processing', whiles all the other industries had a negative average percentage changes.

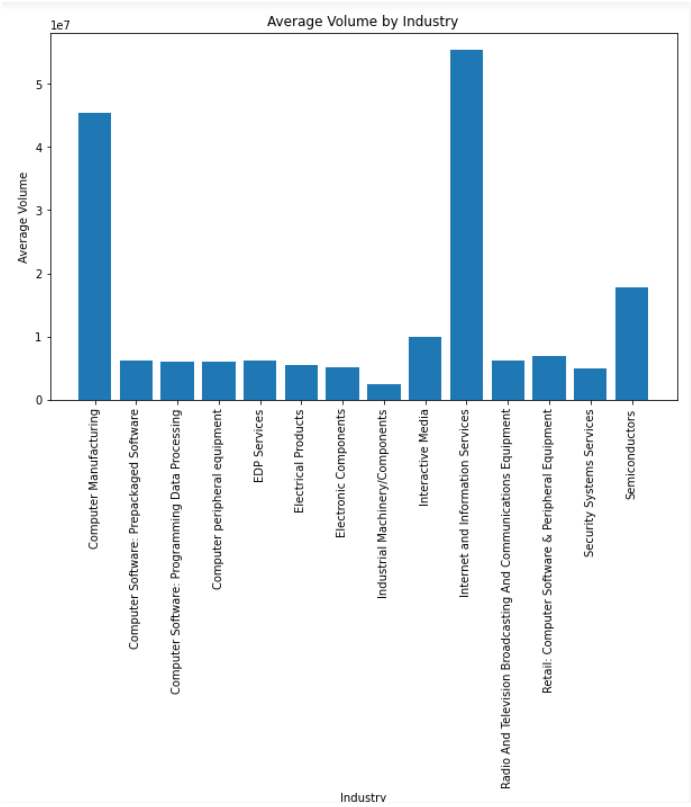
Figure 1



Idiom	Bar Chart
What: Data	One quantitative value attribute and one categorical attribute
How: Encode	Line Marks express values with a vertical and Horizontal Positions

Secondly, we created another bar chat that compared the industries with the average Volume of shares bought or sold. This will give a fair idea to any user on the viability of the shares or stock floated on the market. This is particularly important because it tells the individual the industry that has a higher trading volume indicating a higher market activity, reflecting the level of buying and selling which in turns has impact on the liquidity and trading conditions. Figure 2 show that the' Internet and Information Services' has the highest average Market Volume compared to other Industries.

Figure 2



Idiom	Bar Chart
What: Data	Table with one quantitative value attribute and one categorical attribute
How: Encode	Line Marks express vaulues with a vertical and Horizontal Positiions

2.2. Interactivity

We also considered the fact that the user may want to explore the dashboard to get an in-depth understanding on the stock market so we came up with three interactive graphs.

Figure 3, shows a choropleth map of the World Stock Trade showing the countries and the volume of shares that are floated. The user is able to rotate the map to reveal each country and the corresponding volumes

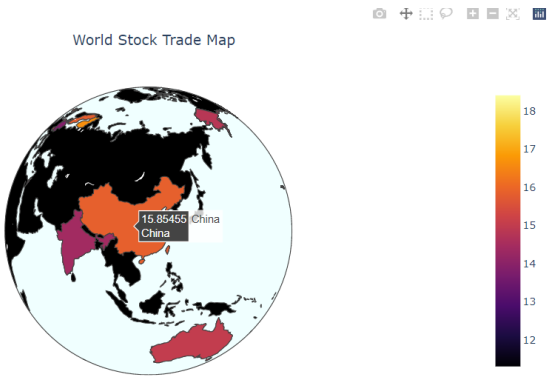
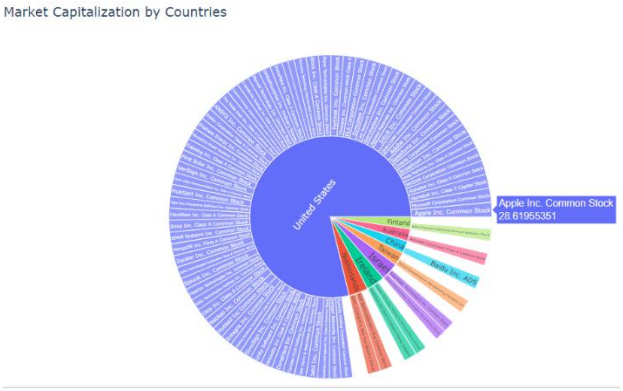


Figure 3

Idiom	Choropleth Map
What: Data	Table with quantitative data per region/country
How: Encode	Space: Geometry for area mark boundary, Colour: sequential segmented colourmap

We also created a sunburst map that shows the Market Capitalization of the companies with respect to the countries in which the stocks were floated. A click on the country reveals the companies within it and are ranked based on their Market Capitalization. Figure 4 shows the sunburst map;



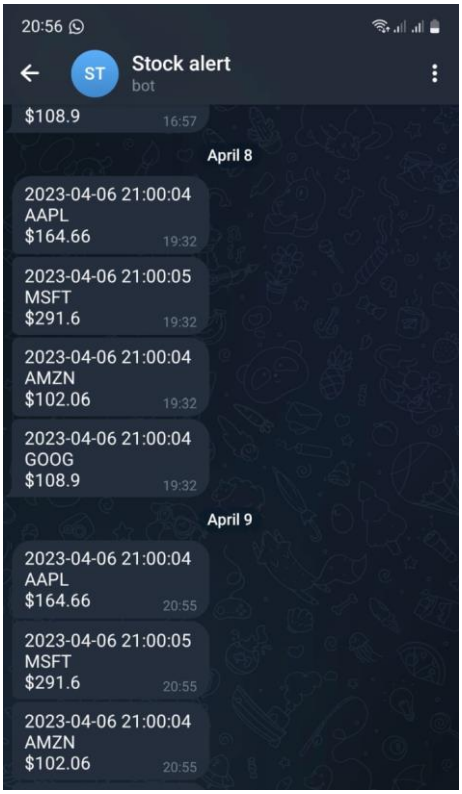
Idiom	Sunburst Map
What: Data	Table with one quantitative value attribute and one categorical attribute
How: Encode	Area marks with angle channel, Radial layout

In figure 4 above, Apple Inc. Common Stock has the highest amount of Market Capitalization in the United States Stock Market.

Fig 5. The Stock Market Notifications System (Email and SMS)

In Figure 5. Which is the main figure in our project aims to show the user all top 100+ Technology stocks with the price change over time. Within the graph the user can decide to choose whether they will receive notifications by email, SMS or Telegram.

Example. We can see in the graph above Microsoft is trading at 291.6 dollar so the user can choose to receive Telegram example when price change to 292 or 290 etc. in order to purchase or sell their stocks. Below is the screenshot of Telegram notifications received by a user while testing the app.



2.3. Technical Aspect of our Project

This project implements a stock market notification system with email, SMS, and Telegram alerts using Python's Plotly and Dash libraries, as well as the FMP API for real-time stock data. The project includes a dashboard with various features such as stock history, alerts for price changes, choropleth maps, and sunburst plots.

The app is created using Dash and the layout is defined with an HTML div. The layout includes a dropdown menu for selecting a stock, a line chart for displaying stock price history, and various input elements for setting up email and SMS alerts. Additionally, there are choropleth maps and sunburst plots to display information about the stocks.

The email and SMS notification systems are implemented using the Twilio and Gmail APIs. The Twilio API is used to send SMS alerts to mobile devices, while the Gmail API is used to send email alerts to email addresses.

Finally, a Telegram notification system is implemented using the Telegram Bot API. The Telegram Bot API is used to send real-time stock data to users who subscribe to the bot. The bot can be configured to send alerts for specific stocks based on user preferences.

Overall, this project provides a comprehensive stock market notification system with a user-friendly dashboard and multiple notification options.

Our GitHub link: https://github.com/johnasc/Data-Visualization

3. Results and Limitations

3.1. Results

In our project we managed to get the following results:

1. Real-time stock price updates: The project allows users to get real-time updates on the stock prices of 50 tech companies listed on the Nasdaq stock exchange. This can be useful for investors or traders who need to monitor the stock prices of multiple companies simultaneously.
2. Customizable email and SMS alerts: Users can set up email or SMS alerts for price changes of their chosen stock. This means that they will receive a notification whenever the stock price goes above or below a certain threshold, which can help them make informed investment decisions.
3. Interactive visualization of stock prices: The project includes interactive visualizations of stock prices, such as line charts and choropleth maps, which can help users better understand the trends and patterns in the stock market. The sunburst plot also provides a hierarchical view of the market capitalization of the selected tech companies.
4. Integration with Telegram messaging platform: The project includes a Telegram notification system that allows users to receive real-time updates on their chosen stock prices directly on their mobile devices. This can be useful for users who are constantly on the go and need to stay updated on the stock market.

Overall, the stock notification project provides users with a powerful tool to monitor the stock market and make informed investment decisions based on real-time data and customizable alerts.

3.2. Limitations

One limitation of this project is the reliance on SMS and email notifications. While many people have access to email and mobile phones, not all phone networks provide their SMS gateway, which could limit the scope of this project. Additionally, email notifications can be filtered into spam or other folders, making it possible for important alerts to be missed.

Another limitation is that the project is designed to work specifically with Nasdaq tech stocks and the FMP API for real-time stock price data. While this works well for the purposes of the project, it is limited in scope and may not be suitable for other stock markets or industries.

Also the reliance on the Financial Modeling Prep (FMP) API for real-time stock price updates. While FMP is a popular and widely used API for financial data, it is not the only source of real-time stock prices. In addition, FMP may not always be the most reliable source for real-time stock prices, as there may be occasional lags or inconsistencies in the data. As a result,

the accuracy and reliability of the stock price updates in the notification system may be compromised.

Furthermore, FMP has a limited free tier, which limits the number of API requests per day. This means that if the system is used frequently or with a large number of users, it may hit the API request limit, which can lead to errors or even the suspension of the API key. This could disrupt the functionality of the notification system and prevent users from receiving real-time updates on their chosen stocks.

The choice to use Telegram as the messaging platform for this project could also be seen as a limitation, as not all users may be familiar with or prefer this platform. However, Telegram was chosen for its security and privacy features, which are important considerations for many users.

Lastly, there are limitations related to the specific implementation of the project. For example, the project is designed to update stock prices every 10 seconds, which could lead to a large volume of notifications and may not be necessary for all users. Additionally, the project assumes that users have already provided their email and phone number for notification purposes, which may not always be the case.

4. Conclusion

In conclusion, the stock market notification system project has demonstrated how to build a system that sends real-time stock price alerts to users through different communication channels such as email, SMS, and Telegram. The system has used live stock price data from FMP API and Nasdaq tech stocks as a dataset. It has also incorporated interactive data visualization components such as graphs, maps, and dropdown menus to enhance the user experience.

However, the project has several limitations, including the availability of SMS gateways for different phone networks and the FMP API's real-time data updates' reliability. Future work could involve addressing these limitations by exploring alternative communication channels such as WhatsApp, Signal, or Facebook Messenger for wider inclusivity and exploring other real-time stock price data sources to ensure reliable and timely alerts to users.

Overall, the stock market notification system project has provided a useful template for developers and finance enthusiasts interested in building similar systems for personal or commercial use. The integration of different communication channels and data visualization components makes it a comprehensive solution for monitoring stock prices and receiving timely alerts.

5. References

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