Financial Programming

Session 4 - Data Visualization with Python (cont.)

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Outline

- Review Session 3: Data Visualization with Python: Matplotlib
- Plotly – Open Source Graphing Libraries for Python
- Monte Carlo Simulation
- Building Python App with Streamlit
- Exercises

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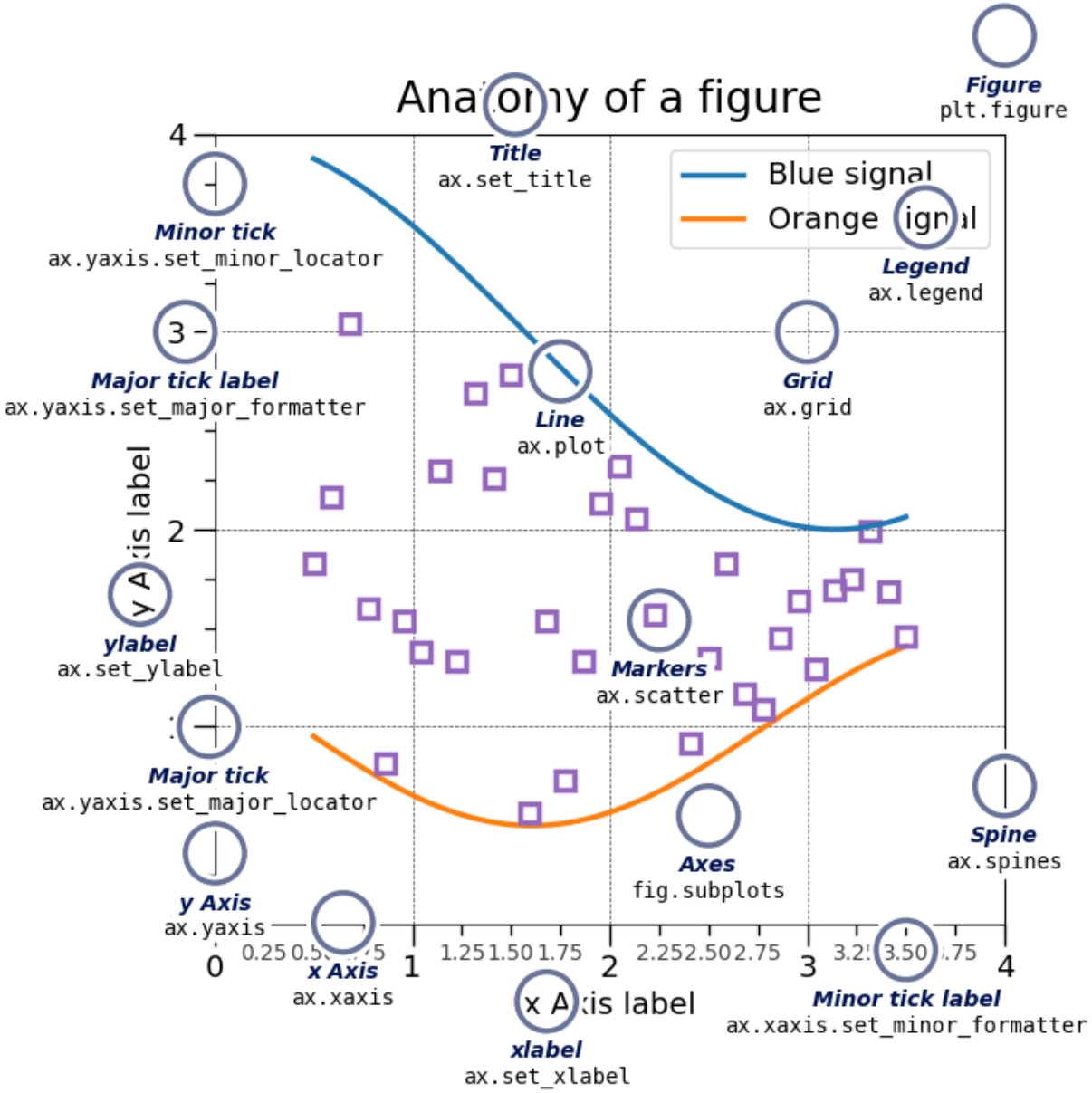
Review Session 3: Data Visualization with Python: Matplotlib

- Data Visualization with Python: Matplotlib
  - Anatomy of a figure
  - Common types of plot
    - Line plot (e.g. time series)
    - Scatter plot
    - Bar chart
    - Histogram
    - Boxplot



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Plotly – Open Source Graphing Libraries for Python

- Plotly JavaScript library (plotly.js).

- Interactive/animated web-based visualizations for Jupyter Notebooks, web applications ++.

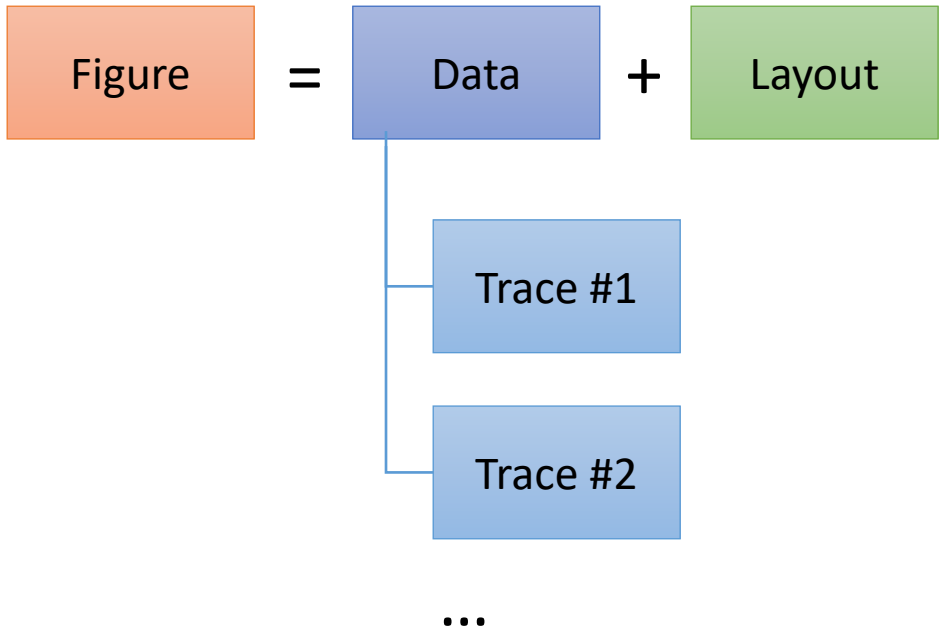
- Plotly interface
  - Plotly Express

    ```
    import plotly.express as px
    ```
  - Graph Objects

    ```
    import plotly.graph_objects as go
    ```

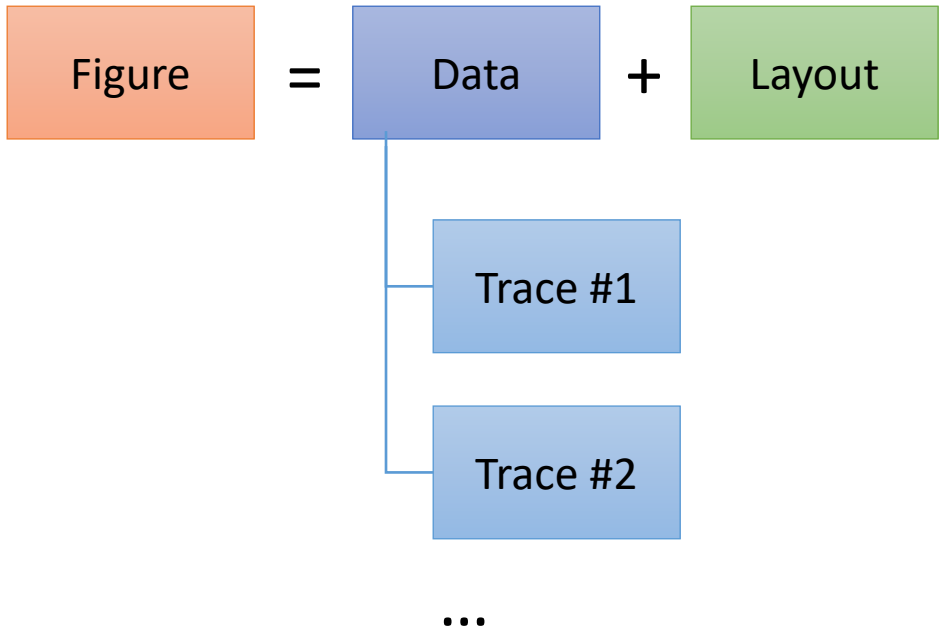
- Keywords
  - Data = Trace 1, 2,…
    - Trace = Data + plot type
  - Layout

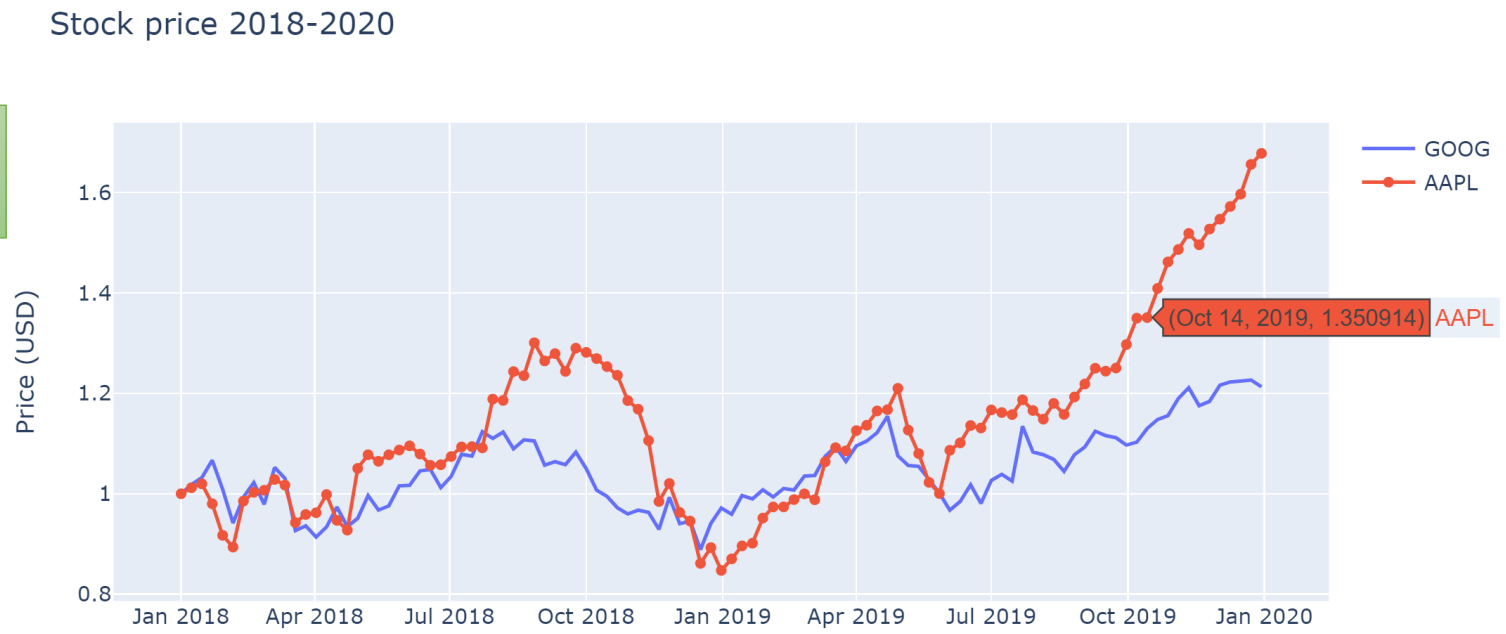
Plotly | Structure of a Plotly Chart




```
# Get sample data
import plotly
df = plotly.data.stocks()

# Visualize with plotly
import plotly.graph_objects as go

# Traces and Data
trace1 = go.Scatter(x=df['date'], y=df['GOOG'], mode='lines', name='GOOG')
trace2 = go.Scatter(x=df['date'], y=df['AAPL'], mode='lines+markers', name='AAPL')
data = [trace1, trace2]

# Layout
layout = go.Layout(title='Stock price 2018-2020', yaxis={'title':'Price (USD)'})

# Initiate a figure
fig = go.Figure(data=data, layout=layout)
fig.show()
```

Plotly | Structure of a Plotly Chart



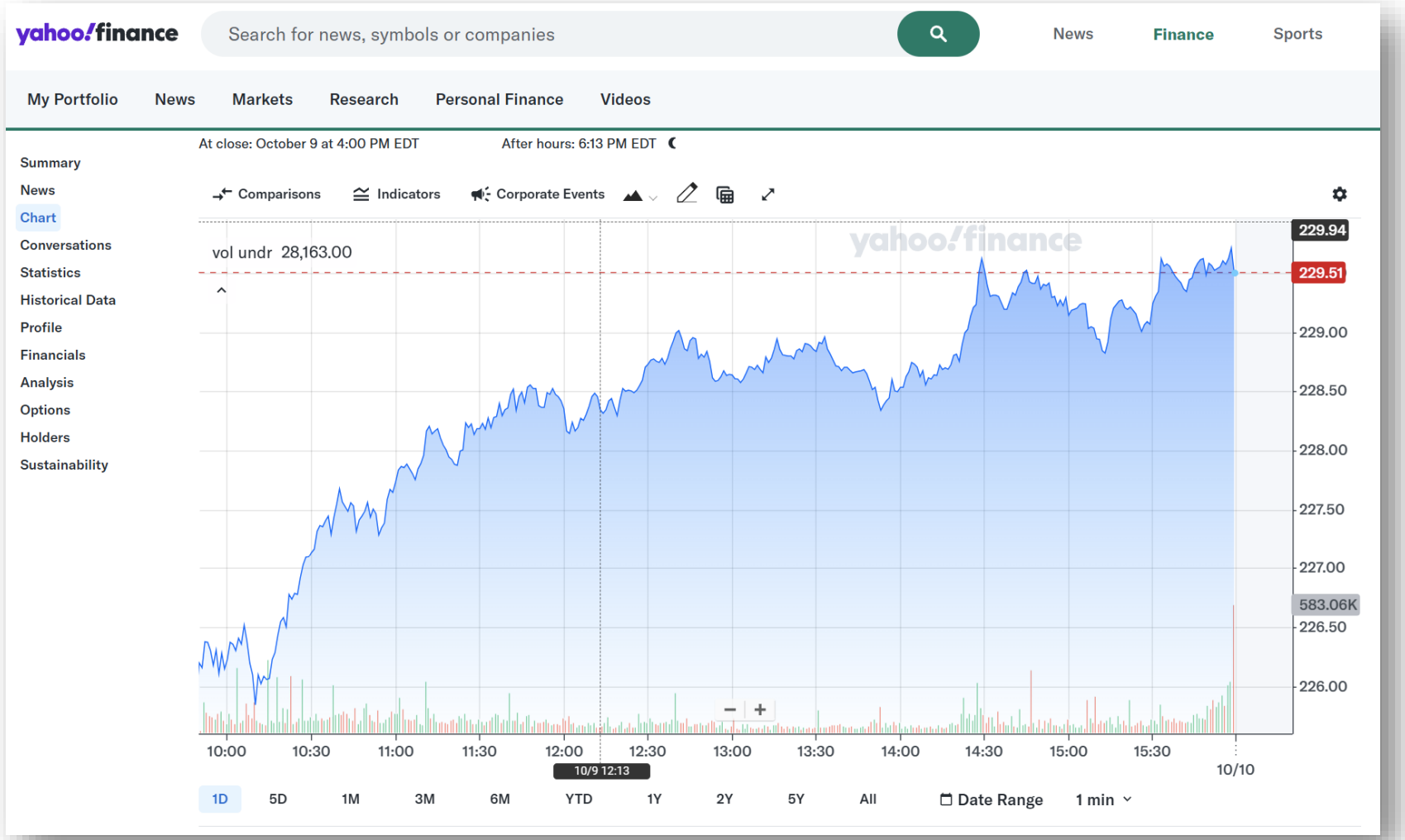


Plotly | Types of Plot

- Line plot
- Scatter plot
- Bar chart
- Histogram
- Box plot
- Much more: https://plotly.com/python/

Plotly | Summary exercises

- **Exercise:** Using Plotly to replicate the below chart of Apple (AAPL) stock price from Yahoo Finance.



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Monte Carlo Simulation

Example 1*: Write a function to print out the dates of the weekdays (Monday-Friday) of the current week. For example:

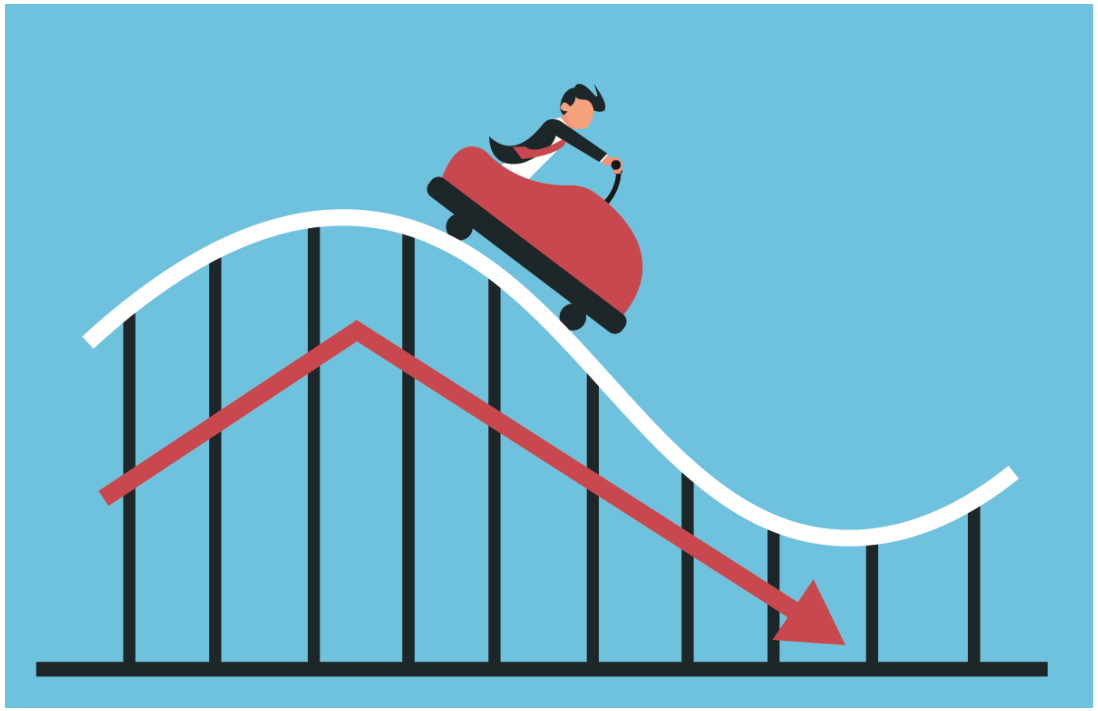
Monday: 20XX-YY-ZZ
Tuesday: 20XX-YY-ZZ
Wednesday: 20XX-YY-ZZ
Thursday: 20XX-YY-ZZ
Friday: 20XX-YY-ZZ

Monte Carlo Simulation

Example 2*: Write a function which receives a of stock name (ticker), then print out the stock close price of the current week.

Monte Carlo Simulation

Example 3*: Write a function which receives a of stock name (ticker) and a period (in days). Calculate and return the daily volatility of the stock closing price during the past days. Daily volatility can be calculated by taking the standard deviation (.std() function) of the daily returns. Daily returns is the daily changing rates of the stock price (in percentage), and can be calculated by Pandas' .pct_change() function.



Monte Carlo Simulation

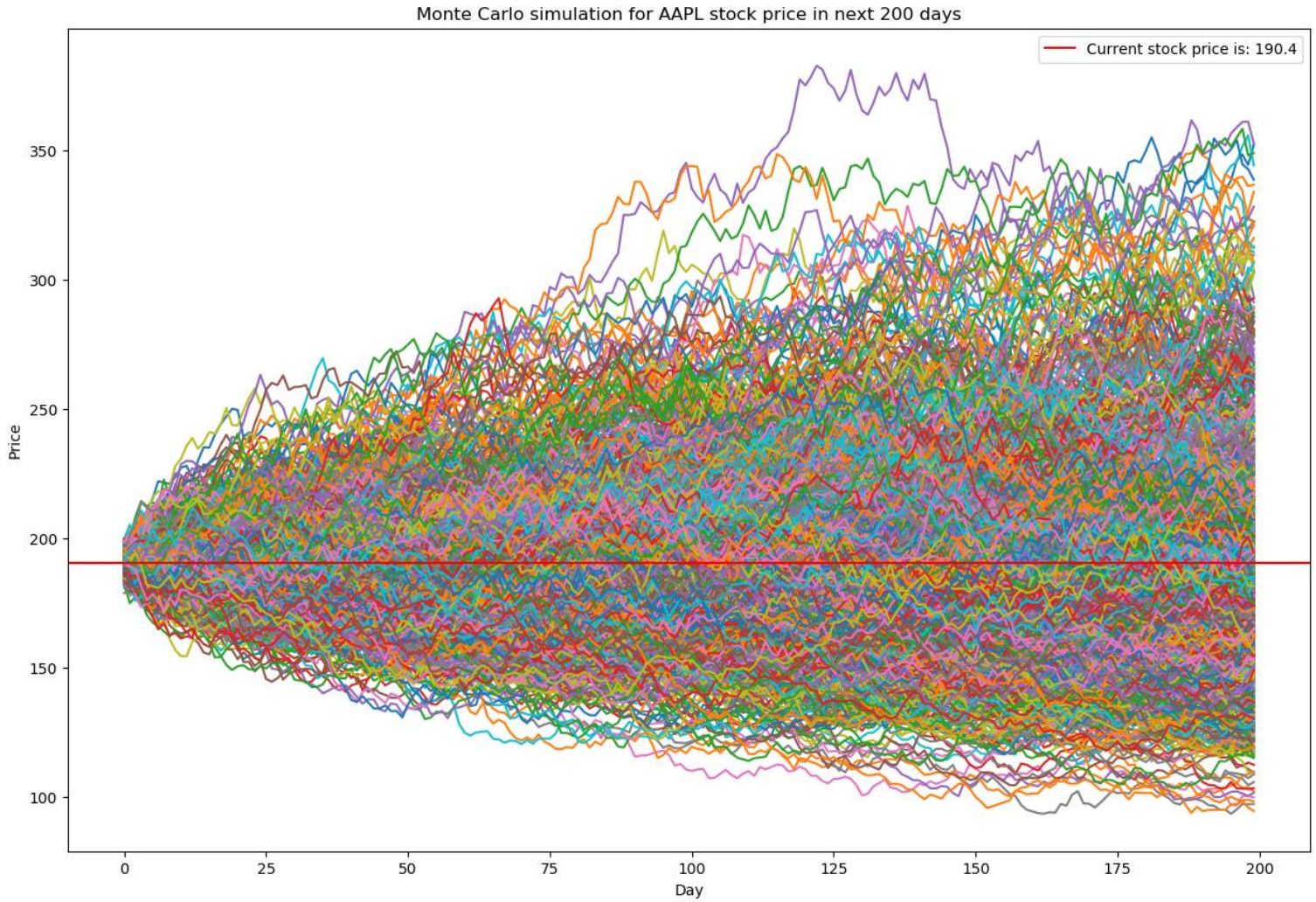
Example 4: Based on the previous example, write another function that receives a of stock name (ticker) and a period (in days). Return the daily, weekly and annually volatilities of the stock closing price.

Hints:

- Daily Volatility $= \sqrt{\sigma^2_{\text{Daily Returns}}} = \sigma_{\text{Daily Returns}}$
- Weekly (5 trading days) Volatility $=$ Daily Volatility $* \sqrt{5}$
- Annually (252 trading days) Volatility $=$ Daily Volatility $* \sqrt{252}$

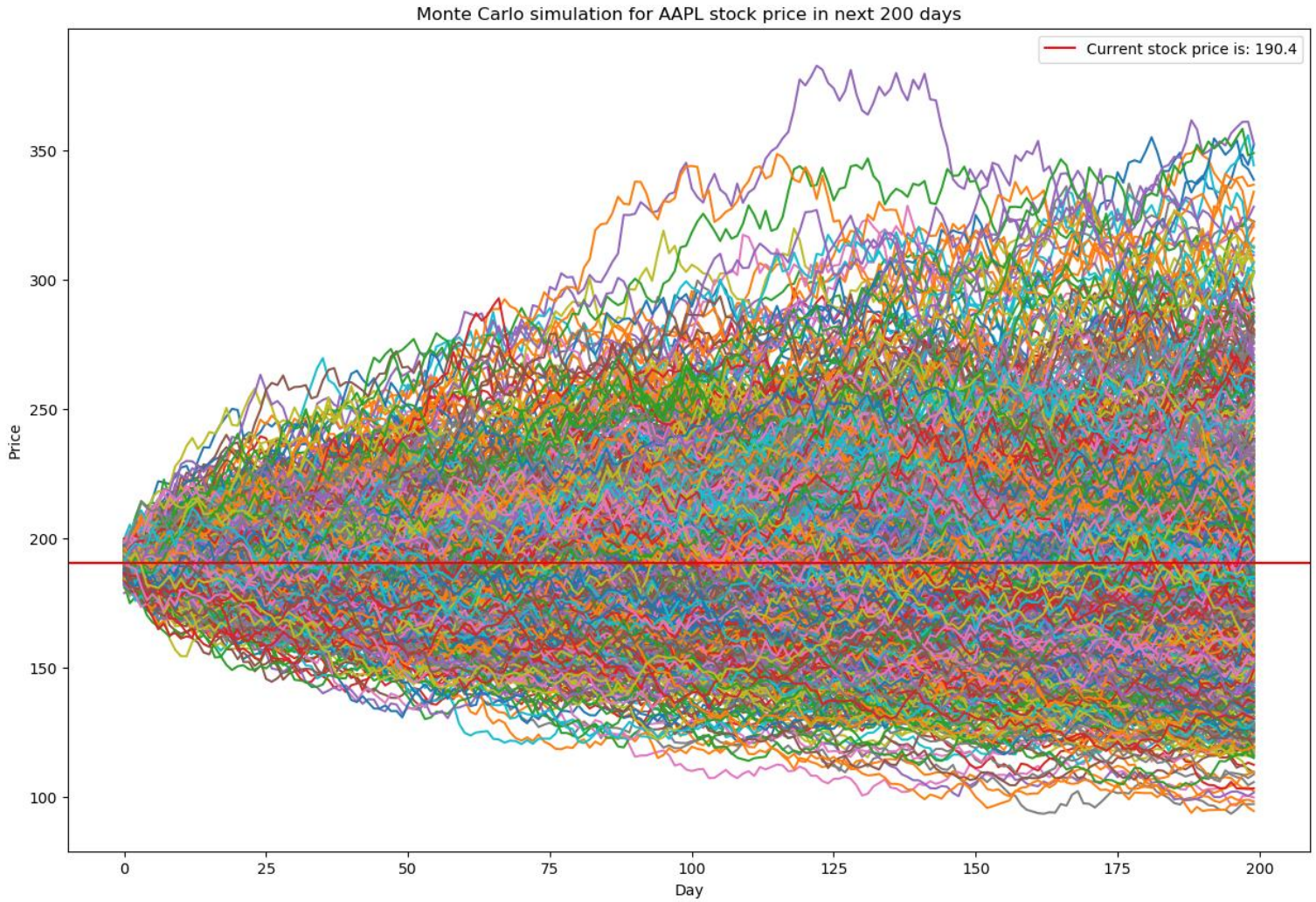
Monte Carlo Simulation

Example 5*: Using Monte Carlo simulation to generate future stock price of Apple (AAPL).



Monte Carlo Simulation

Example 5*: Using Monte Carlo simulation to generate future stock price of Apple (AAPL).



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Streamlit

Source: https://streamlit.io/

Streamlit

- Installation, from Anaconda Prompt:

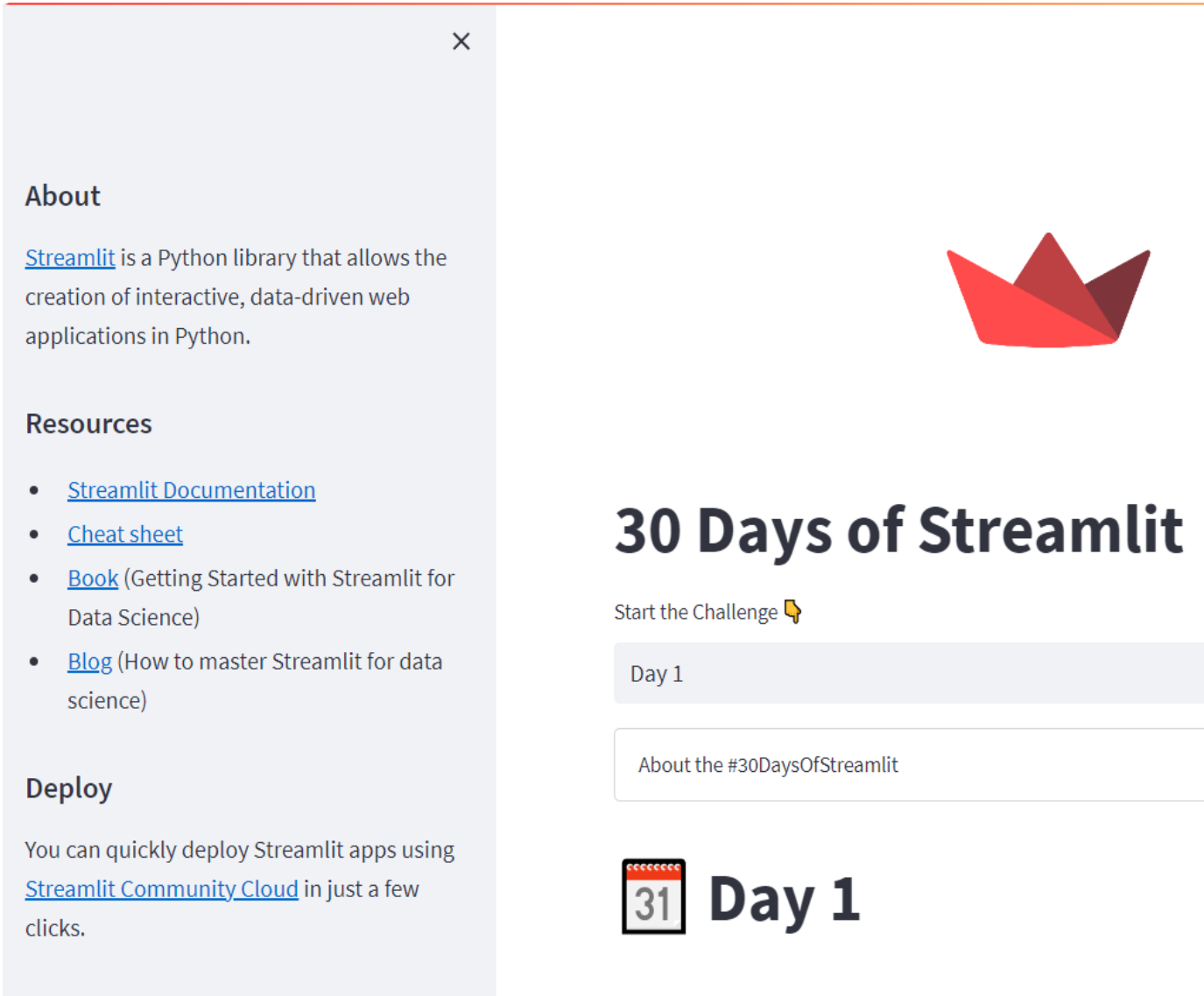
  conda install -c conda-forge streamlit

  or

  pip install streamlit

- Running test (from Anaconda Prompt):

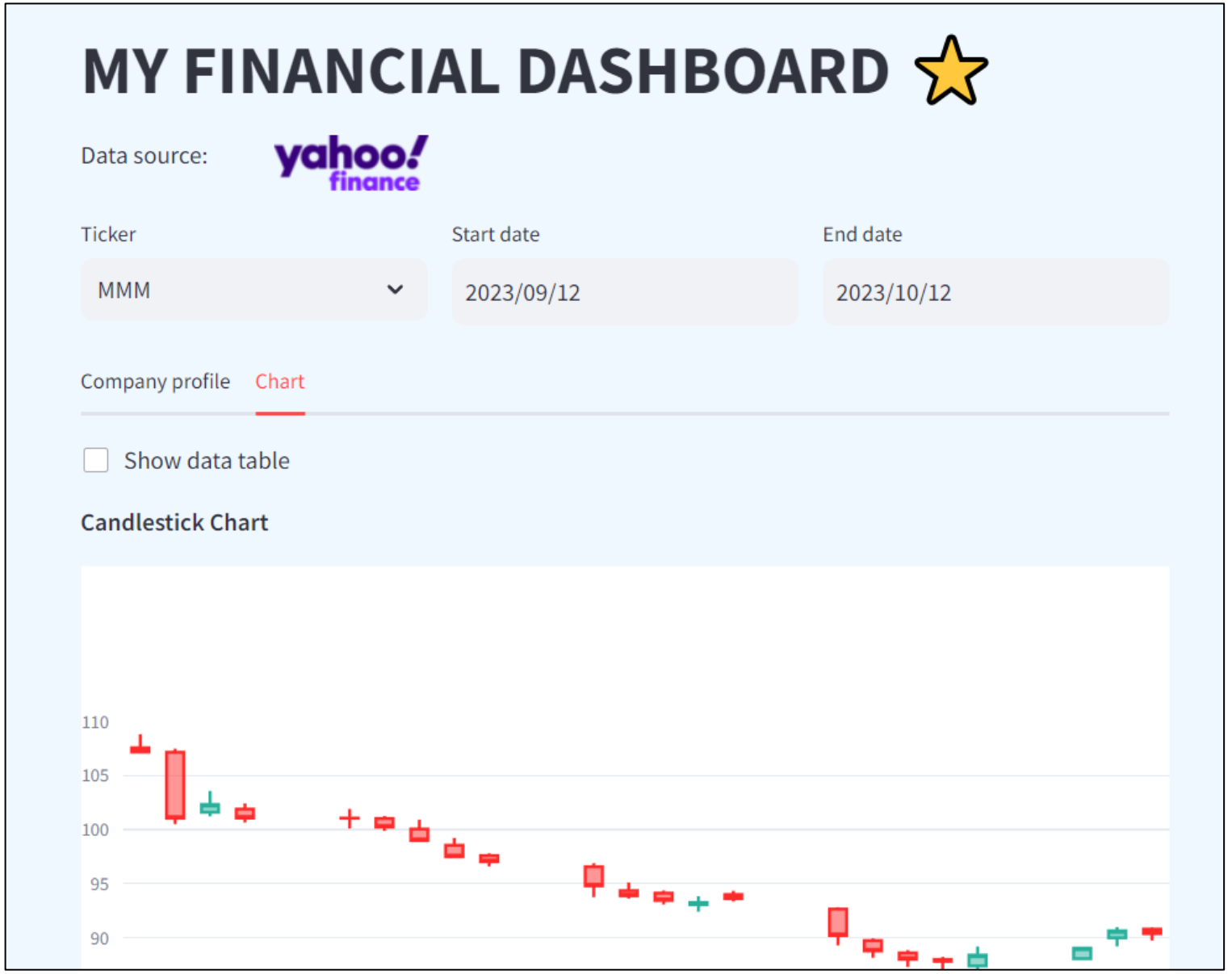
  streamlit hello



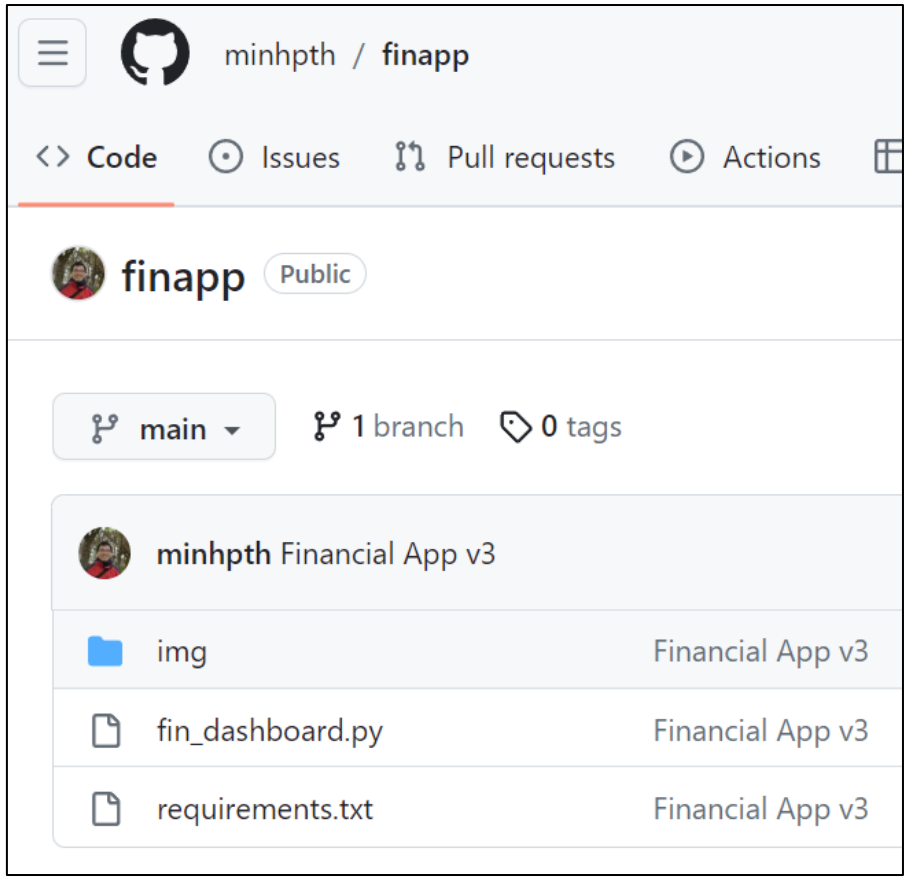
Streamlit

- Documents:
  - Get started: https://docs.streamlit.io/library/get-started
  - 30 Days of Streamlit: https://blog.streamlit.io/30-days-of-streamlit/
  - API reference: https://docs.streamlit.io/library/api-reference
  - Gallery:
    - https://streamlit.io/gallery
    - https://github.com/jrieke/best-of-streamlit
    - https://github.com/shwetanaren/streamlit-financial-dashboard

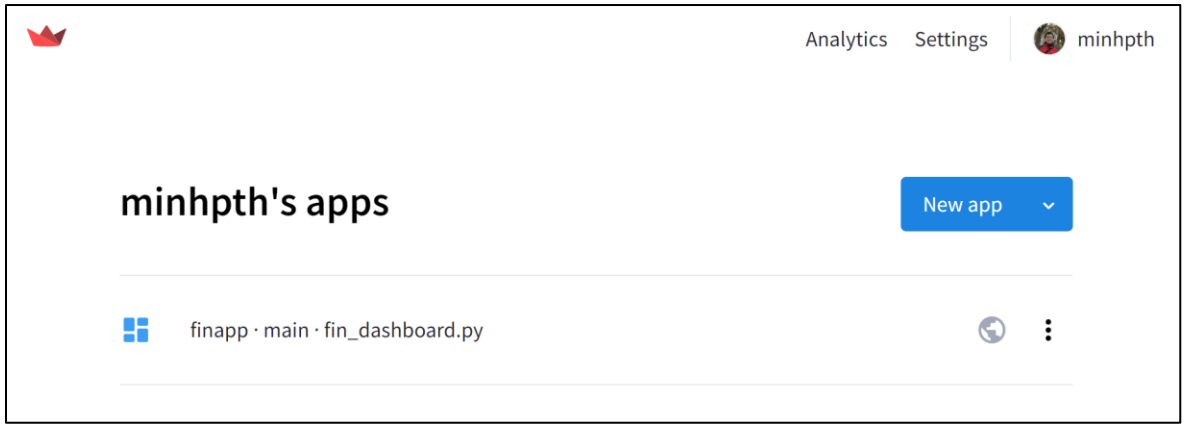
Streamlit | Simple financial app



Streamlit | Deploy & Share



GitHub + requirements.txt

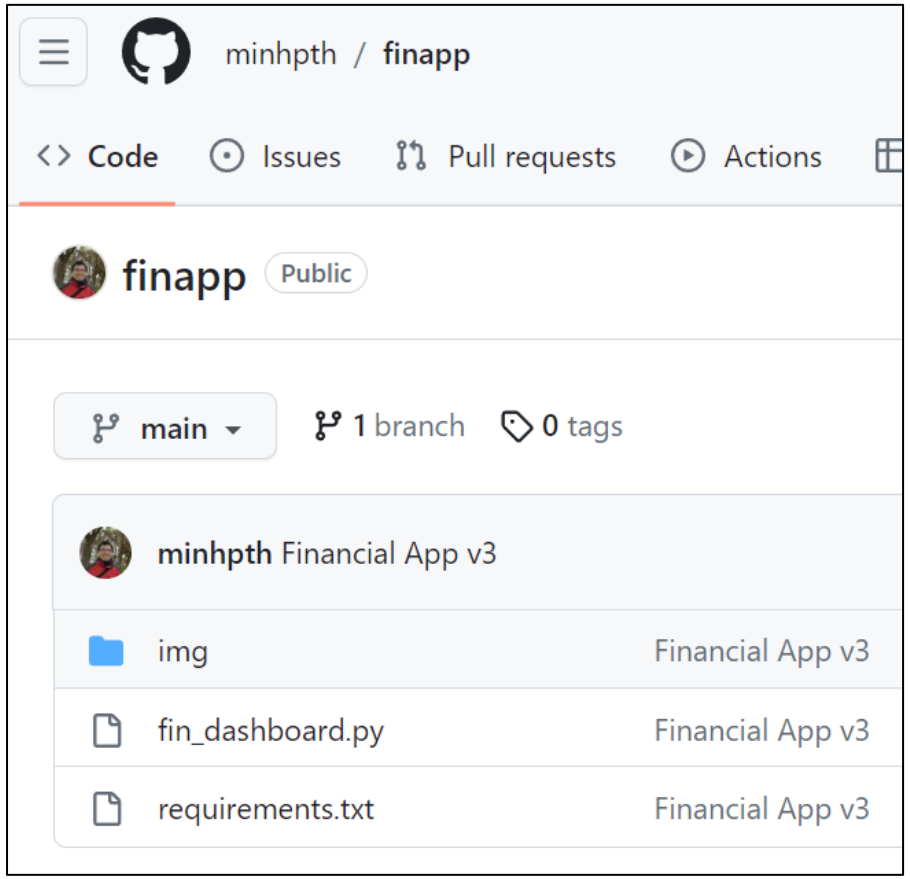


Streamlit App Online
Community Cloud: https://streamlit.io/cloud

Example: Streamlit (finapp-nrjdo8epusgadzjq7n2cz3.streamlit.app)

Streamlit | Deploy & Share | Step 1 - GitHub

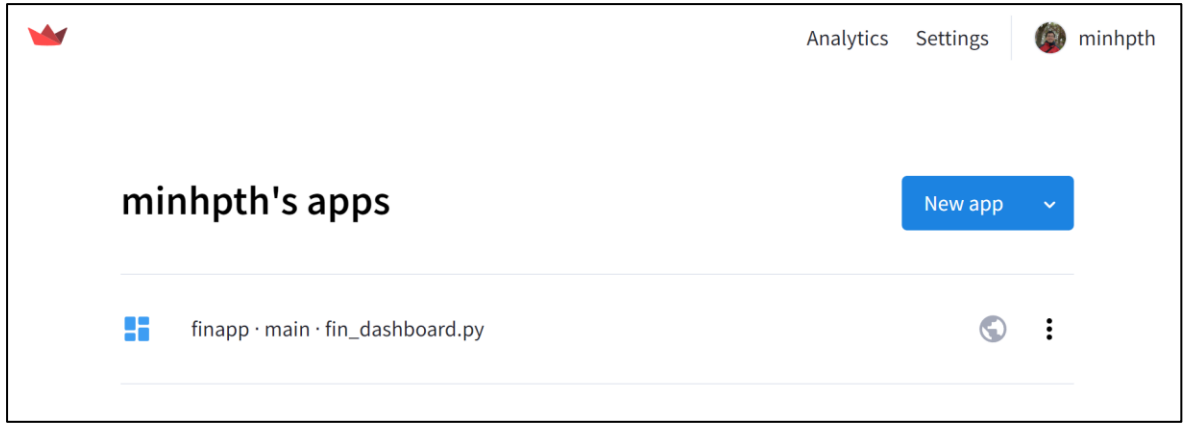
- Put the dashboard + files into a folder
- Create and edit the requirements.txt file
- Create your GitHub account
- Upload the dashboard folder to a GitHub repository



GitHub + requirements.txt

Streamlit | Deploy & Share | Step 2 - Streamlit Cloud

- Go to Streamlit Community Cloud: https://streamlit.io/cloud
- Sign in with your GitHub account
- Create new cloud app by selecting your GitHub repository
- Deploy the app, wait and enjoy !



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Summary | Session 4 - Data Visualization with Python (cont.)

- Plotly

- Monte Carlo Simulation
  - yfinance
  - Daily return
  - Daily volatility
  - Value at risk

- Building Python App with Streamlit
  - Simple app
  - App with multiple tabs

Homework

- Reading
  - Course book, Chapter 7, 8, 10

- DataCamp
  - Cleaning Data in Python (~4h)

Other Streamlit Examples

1. Gallery: Gallery • Streamlit
2. best-of-streamlit: GitHub - jrieke/best-of-streamlit: 🏆 A ranked gallery of awesome streamlit apps built by the community
3. streamlit_multipage_financial_dashboard: GitHub - shwetanaren/streamlit-financial-dashboard: Created a financial dashboard to testdrive streamlit's python based dashboard building framework.
4. Building a Stock Market App with Python Streamlit in 20 Minutes: Building a Stock Market App with Python Streamlit in 20 Minutes | by Dr. Dataman | Python in Plain English
5. Build a Stock Screening Dashboard with Streamlit: Build a Stock Screening Dashboard with Streamlit | by Carl Westerby | Medium
6. Mastering Streamlit: Multi-Paged Stock Tracker Dashboard: Mastering Streamlit: Multi-Paged Stock Tracker Dashboard | by Cawin Chan | DataDrivenInvestor
7. A Streamlit Dashboard for the Alpaca API Algo Trading Platform: A Streamlit Dashboard for the Alpaca API Algo Trading Platform | by McKlayne Marshall | Sep, 2021 | Level Up Coding (gitconnected.com)