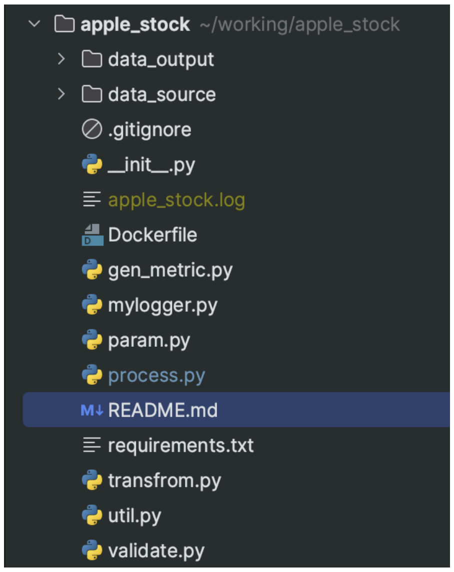
APPLE STOCK DATASET PROCESS

1. Purpose

The purpose of this document is to present how to process an Apple stock dataset. This document has three parts

- Project structure
- Set up and run project
- Technical explanation

2. Project structure



```
apple_stock ~/working/apple_stock
  data_output
  data_source
  .gitignore
  __init__.py
  apple_stock.log
  Dockerfile
  gen_metric.py
  mylogger.py
  param.py
  process.py
  README.md
  requirements.txt
  transfrom.py
  util.py
  validate.py
```

The project includes the following components:

- **data_source**: This is the location that stores the data source.
- **data_output**: This is the location that saves the output results of the data.
- **Dockerfile**: This file is used to create a Docker image.
- **Log**: The log is implemented in the file 'mylogger.py,' and the log file is 'apple_stock.log.' This file keeps track of all the steps in the processing.

- **param**: This is the place to declare all parameters used in the project.
- **requirements**: This lists all the libraries that need to be installed in the project.
- **util**: This is the place that defines all utility functions used for this project.
- **validate**: This is the place that defines functions used for validating data in the project.
- **transform**: This is the place that defines functions used for transforming data in the project.
- **gen_metric**: This is the place that defines functions used for aggregating data and generating metric data.
- **process**: This file defines the main function.

3. Setup and Run the project

The project could be run from Docker image or directly from python.

3.1 Run from Docker image

We need Docker desktop, you can download it from
https://www.docker.com/products/docker-desktop

Steps to build an image and run it as below:

```
# Build Docker Image

docker build -t process .

# Run and create a container “apple_stock”

docker run  -p 8080:8080 --name apple_stock process
```

3.2 Run from source code.

To install the environment and run the project, follow these general steps:

Set up Environment:

- Install Python: Ensure Python is installed on your system. You can download it from python.org.
- Create a Virtual Environment (optional but recommended): Navigate to the project folder in the terminal and run:

```
python -m venv venv
```

- Activate the virtual environment:
    - On Windows: venv\Scripts\activate
    - On macOS/Linux: source venv/bin/activate

Install Dependencies:

- Navigate to your project folder where the requirements.txt file is located.
- Run the following command to install dependencies:

```
pip install -r requirements.txt
```

Run the Project:

- Execute the main file or command to start your project.

```
python process.py
```

3. Technical explanation

The project is compatible with Python version 3.10 and necessitates specific libraries outlined below.

- Pandas 2.1.4
- Pandas_schema 0.3.6
- Dash 2.14.2
- Plotly 5.18.0

he data will undergo the following steps:

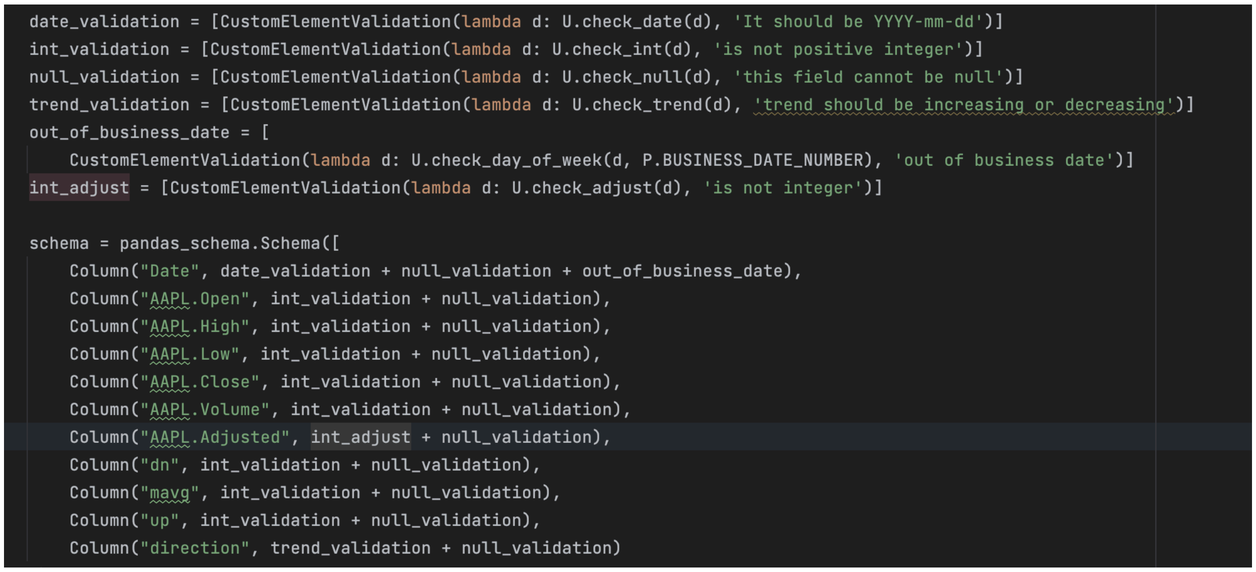
- Cleaning and validating data
- Transforming data
- Aggregating data
- Generating metrics
- Visualizing data through a candle chart graph.

Cleaning and validating data : For the Apple stock dataset, certain rules should be applied to the data.

- Date : has format yyyy-mm-dd and should be Monday → Friday and no duplicate
- Price : is float positive
- Adjust : is float and can be negative

- Direction : should have data in [“Increasing”,”Decreasing”]
- All columns are non-null

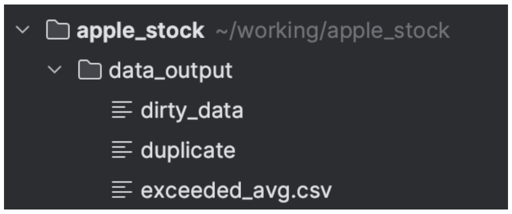
I use **pandas_schema.validation** and **CustomElementValidation** to validate those rules above by define function to check those rules and use lambda function to apply each column



```
date_validation = [CustomElementValidation(lambda d: U.check_date(d), 'It should be YYYY-mm-dd')]
int_validation = [CustomElementValidation(lambda d: U.check_int(d), 'is not positive integer')]
null_validation = [CustomElementValidation(lambda d: U.check_null(d), 'this field cannot be null')]
trend_validation = [CustomElementValidation(lambda d: U.check_trend(d), 'trend should be increasing or decreasing')]
out_of_business_date = [
    CustomElementValidation(lambda d: U.check_day_of_week(d, P.BUSINESS_DATE_NUMBER), 'out of business date')]
int_adjust = [CustomElementValidation(lambda d: U.check_adjust(d), 'is not integer')]

schema = pandas_schema.Schema([
    Column("Date", date_validation + null_validation + out_of_business_date),
    Column("AAPL.Open", int_validation + null_validation),
    Column("AAPL.High", int_validation + null_validation),
    Column("AAPL.Low", int_validation + null_validation),
    Column("AAPL.Close", int_validation + null_validation),
    Column("AAPL.Volume", int_validation + null_validation),
    Column("AAPL.Adjusted", int_adjust + null_validation),
    Column("dn", int_validation + null_validation),
    Column("mavg", int_validation + null_validation),
    Column("up", int_validation + null_validation),
    Column("direction", trend_validation + null_validation)
```

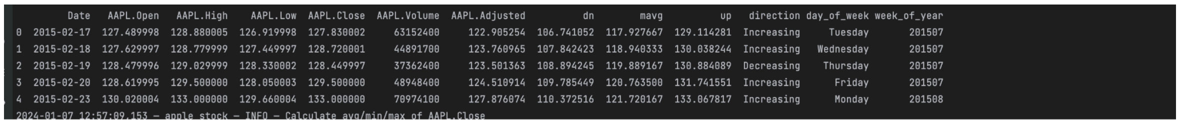
With duplicate Date value : I use function duplicated to check
With data does not match with the rule or duplicate will be extract and save to error file and save at data_output directory



```
apple_stock ~/working/apple_stock
  data_output
    dirty_data
    duplicate
    exceeded_avg.csv
```

Transforming data :

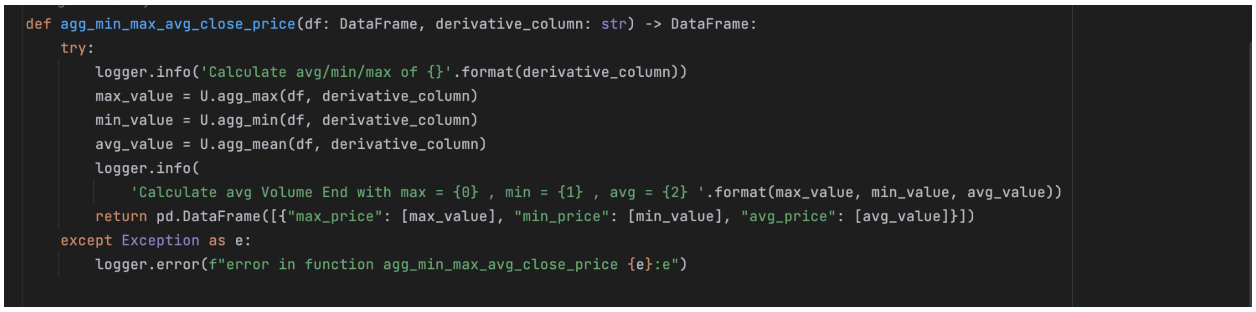
I added two more columns
- day_of_week : using pd.to_datetime(df['Date']).dt.day_name() to get day of week (Monday , Tuesday ….)
- Week_of_year : pd.to_datetime(df['Date']).dt.strftime('%Y%U') to get week of year . Ex: 201508 it means the eighth week of 2015 . Because I will use this column to aggregate data for the week.



```
         Date   AAPL.Open   AAPL.High    AAPL.Low  AAPL.Close  AAPL.Volume  AAPL.Adjusted          dn        mavg          up   direction day_of_week week_of_year
0  2015-02-17  127.489998  128.880005  126.919998  127.830002     63152400     122.905254  106.741052  117.927667  129.114281  Increasing     Tuesday       201507
1  2015-02-18  127.629997  128.779999  127.449997  128.720001     44891700     123.760965  107.842423  118.940333  130.038244  Increasing   Wednesday       201507
2  2015-02-19  128.479996  129.029999  128.330002  128.449997     37362400     123.501363  108.894245  119.889167  130.884089  Decreasing    Thursday       201507
3  2015-02-20  128.619995  129.500000  128.050003  129.500000     48948400     124.510914  109.785449  120.763500  131.741551  Increasing      Friday       201507
4  2015-02-23  130.020004  133.000000  129.660004  133.000000     70974100     127.876074  110.372516  121.720167  133.067817  Increasing      Monday       201508
2024-01-07 12:57:09.153 — apple stock — INFO — Calculate avg/min/max of AAPL.Close
```

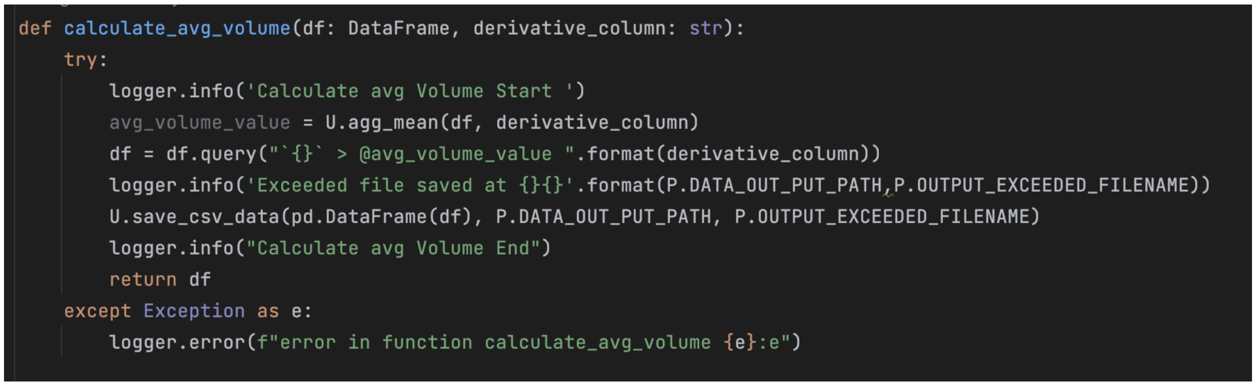
Aggregate data and generate metric :

- I use mean(), min() , max() function to aggregate APPL_Close price .

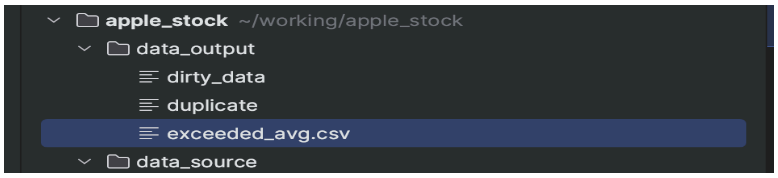


```python
def agg_min_max_avg_close_price(df: DataFrame, derivative_column: str) -> DataFrame:
    try:
        logger.info('Calculate avg/min/max of {}'.format(derivative_column))
        max_value = U.agg_max(df, derivative_column)
        min_value = U.agg_min(df, derivative_column)
        avg_value = U.agg_mean(df, derivative_column)
        logger.info(
            'Calculate avg Volume End with max = {0} , min = {1} , avg = {2} '.format(max_value, min_value, avg_value))
        return pd.DataFrame([{"max_price": [max_value], "min_price": [min_value], "avg_price": [avg_value]}])
    except Exception as e:
        logger.error(f"error in function agg_min_max_avg_close_price {e}:e")
```

- I calculated average of Volume and then find all of records greater than that value then save those rows to file



```python
def calculate_avg_volume(df: DataFrame, derivative_column: str):
    try:
        logger.info('Calculate avg Volume Start ')
        avg_volume_value = U.agg_mean(df, derivative_column)
        df = df.query("`{}` > @avg_volume_value ".format(derivative_column))
        logger.info('Exceeded file saved at {}{}'.format(P.DATA_OUT_PUT_PATH,P.OUTPUT_EXCEEDED_FILENAME))
        U.save_csv_data(pd.DataFrame(df), P.DATA_OUT_PUT_PATH, P.OUTPUT_EXCEEDED_FILENAME)
        logger.info("Calculate avg Volume End")
        return df
    except Exception as e:
        logger.error(f"error in function calculate_avg_volume {e}:e")
```



```
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    dirty_data
    duplicate
    exceeded_avg.csv
  data_source
```
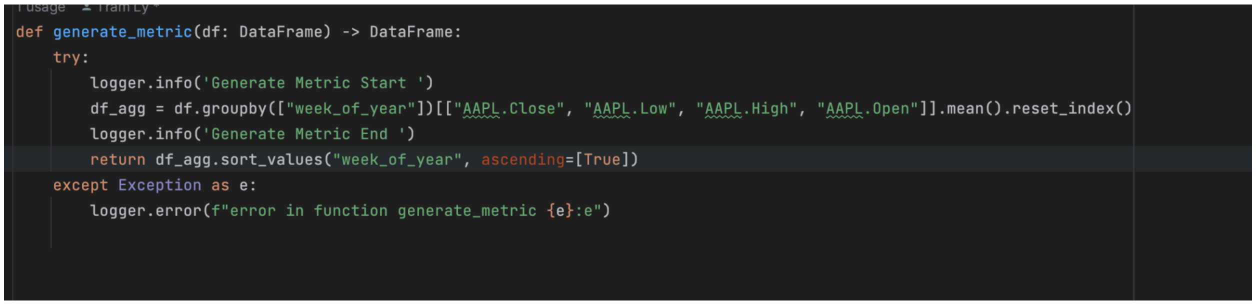

- I generate metric with week level and aggregate with mean value for Columns “APPL.Close” , “APPL.Low”,“APPL.High”,“APPL.Open”



```
def generate_metric(df: DataFrame) -> DataFrame:
    try:
        logger.info('Generate Metric Start ')
        df_agg = df.groupby(["week_of_year"])[["AAPL.Close", "AAPL.Low", "AAPL.High", "AAPL.Open"]].mean().reset_index()
        logger.info('Generate Metric End ')
        return df_agg.sort_values("week_of_year", ascending=[True])
    except Exception as e:
        logger.error(f"error in function generate_metric {e}:e")
```

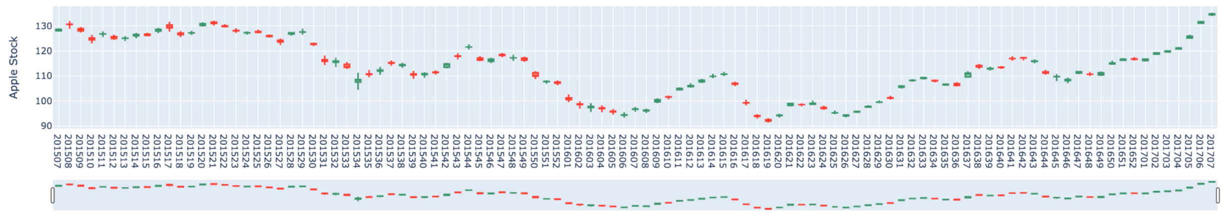
Graph Data

I use dash , plotly package to plot data with candle chart with daily chart and weekly chart
With daily chart :
Axis x is Date
Open is APPL.open
Close is APPL.close
Hight is APPL.high
Low is APPL.low

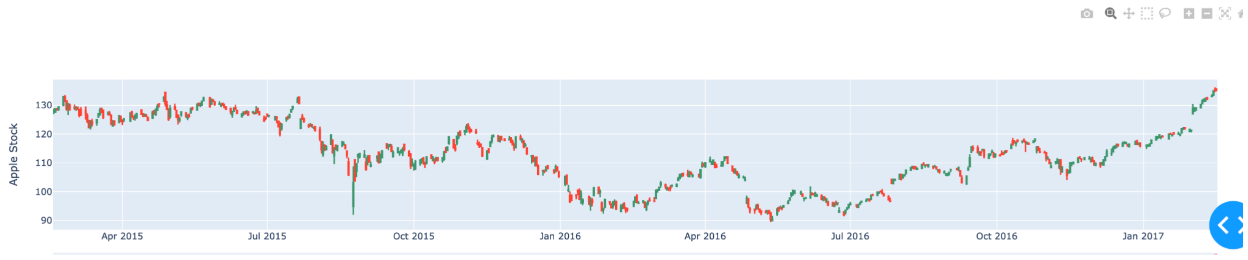
With daily weekly chart :

Axis x is weekof_year
Open is APPL.open(mean of week)
Close is APPL.close(mean of week)
Hight is APPL.high(mean of week)
Low is APPL.low(mean of week)

The mean weekly stock price of Apple throughout the year



The mean daily stock price of Apple throughout the year


Apple Stock
Apr 2015
Jul 2015
Oct 2015
Jan 2016
Apr 2016
Jul 2016
Oct 2016
Jan 2017