Advanced SQL – Challenge 10

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Introduction

I chose to holiday in Hawaii next year. To assist with my trip planning, I learned more about the climate by exploring and analysing Hawaiian climate data using Python, SQLAlchemy, and Matplotlib and designing a climate app using Python and Flask.

Part 1 – Analysis and Exploration of Hawaiian Climate Data

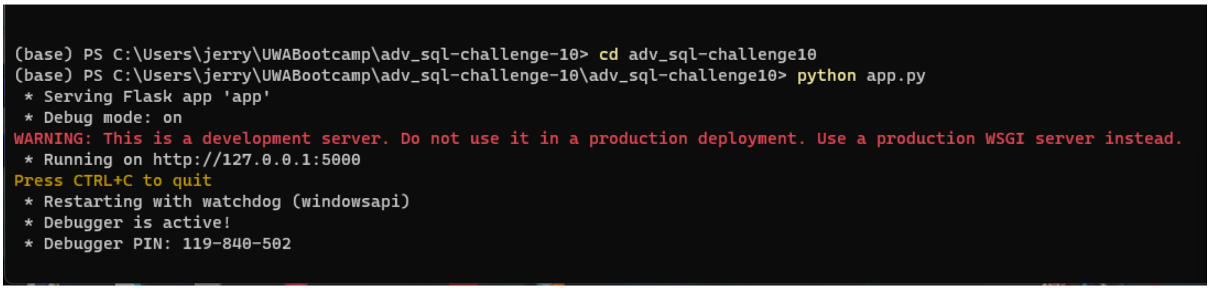
In this section, I used Python and SQLACHEMY to perform a basic climate analysis and data exploration of the provided climate database. I used SQLAlchemy ORM queries, Pandas, and Matplotlib. I did the work in Jupyter Notebook.

- **Precipitation Analysis:**
  - I identified the most recent date in the dataset as 23 August 2017.
  - I extracted precipitation data from the recent date for the previous 12 months, focusing on the "date" and "prcp" values.
  - I loaded the retrieved data into a Pandas DataFrame and explicitly set column names. The DataFrame was sorted by date.
  - I visualised precipitation data using a line plot, showcasing the variations in precipitation over the selected period.
  - I computed and presented summary statistics for the precipitation data, including mean, median, and quartiles.
- **Station Analysis:**
  - I designed a query to calculate the total number of stations in the dataset, providing an overview of the available weather stations.
  - I ranked stations by observation counts in descending order, revealing the station with the highest number of observations as station USC00519281.
- **Temperature Analysis:**
  - For the most active station, I calculated the lowest, highest, and average temperatures.
  - I filtered data for the previous 12 months (TOBS) for the most active station and visualised it as a histogram with 12 bins, offering insights into temperature distribution.

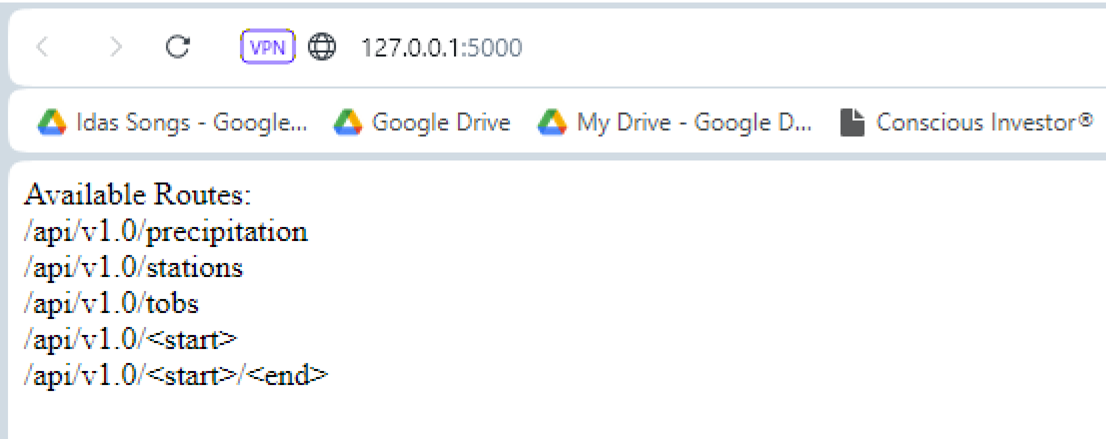
Part 2 – Design a Climate App

I designed a climate app using the instructions given in the Challenge instructions. Below are partial screenshots of each stage of the app.

I ran the program in Anaconda's Powershell Prompt window. When the program starts, the screen below appears (Figure 1), and the Chrome screen below shows the available routes (Figure 2).



1. Running app.py in Powershell Prompt. Running on http://127.0.0.1:5000



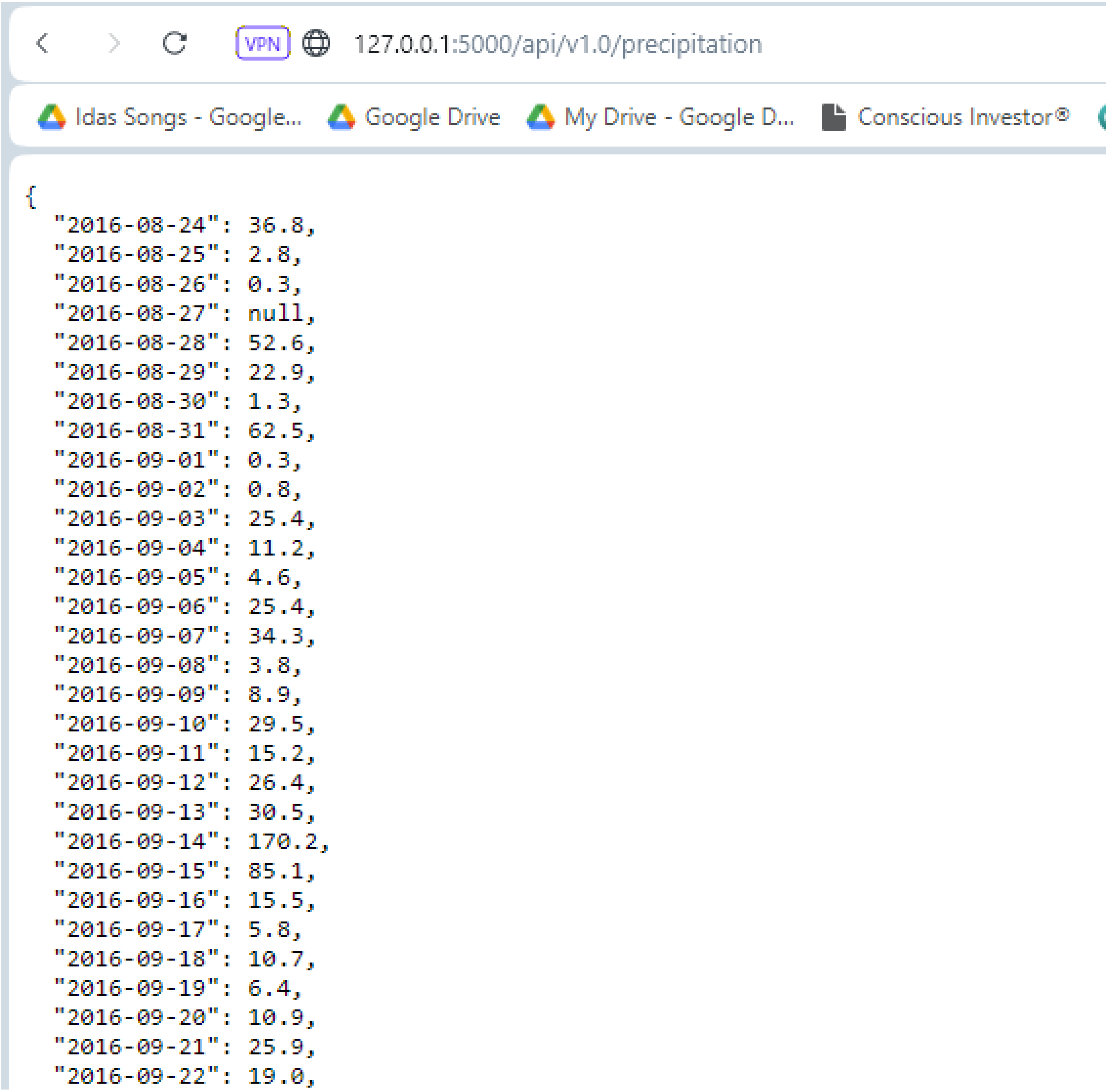
2. Display on URL HTTP://127.0.0.1:5000 – Display of available routes.

On completing the URL for each route, we get the appropriate outputs.
HTTP://127.0.0.1:5000/api/v1.0/precipitation outputs the JSON representation of the dictionary created by the data and precipitation values for the last year of the year of readings for the most active station USC 00519281.

HTTP://127.0.0.1:5000/api/v1.0/stations outputs the JSON list of stations from the data set.

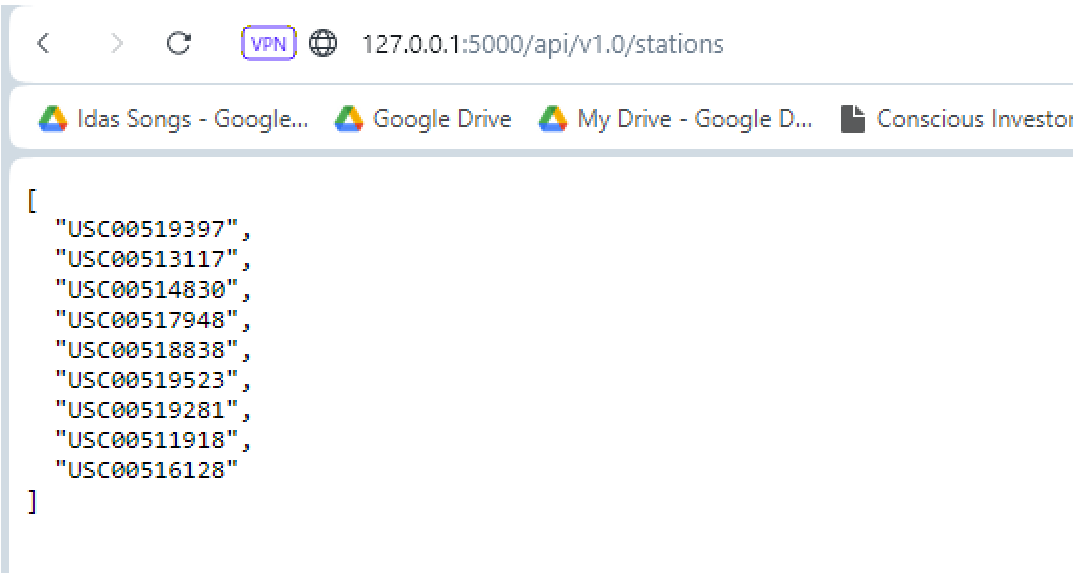
HTTP://127.0.0.1:5000/api/v1.0/tobs outputs the JSON list of temperature observations for the last year of operations.

The last two items output the minimum, average, and maximum temperatures for selected date ranges.



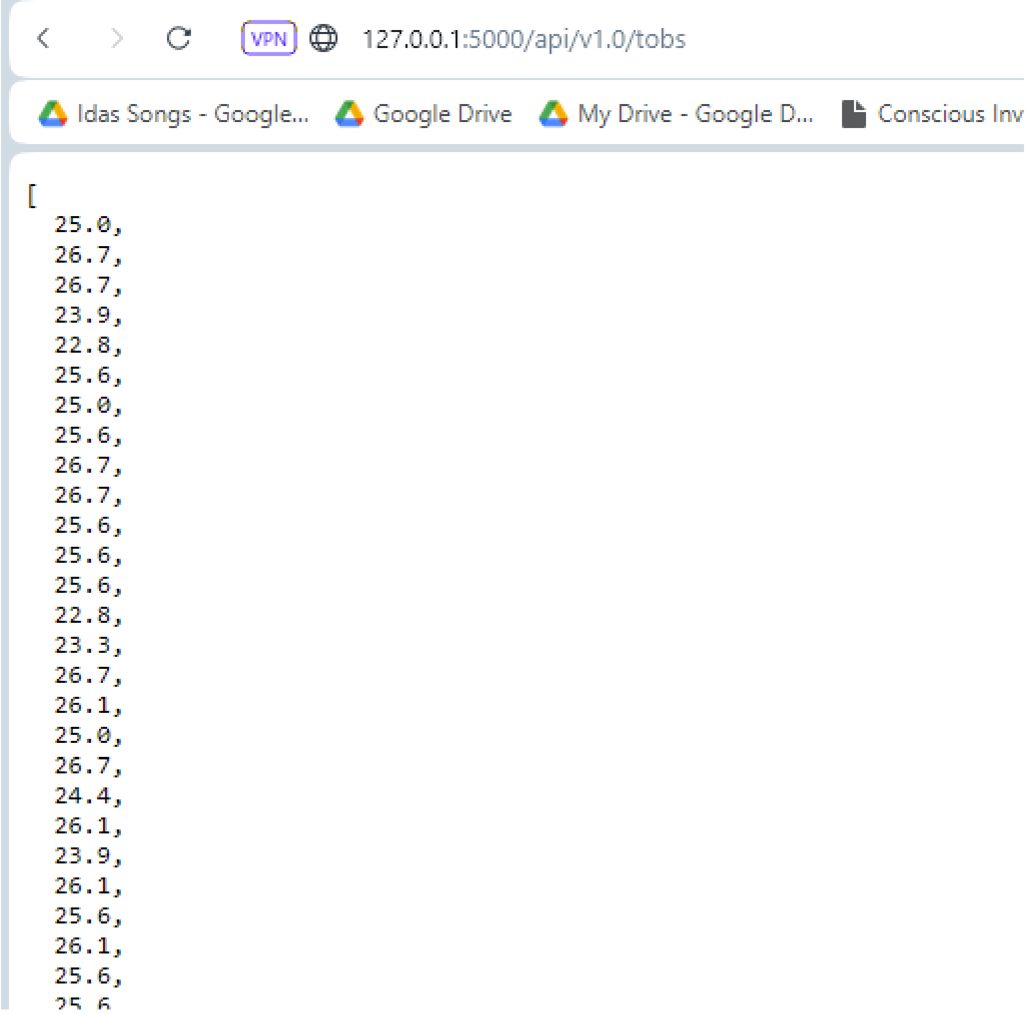

```
{
  "2016-08-24": 36.8,
  "2016-08-25": 2.8,
  "2016-08-26": 0.3,
  "2016-08-27": null,
  "2016-08-28": 52.6,
  "2016-08-29": 22.9,
  "2016-08-30": 1.3,
  "2016-08-31": 62.5,
  "2016-09-01": 0.3,
  "2016-09-02": 0.8,
  "2016-09-03": 25.4,
  "2016-09-04": 11.2,
  "2016-09-05": 4.6,
  "2016-09-06": 25.4,
  "2016-09-07": 34.3,
  "2016-09-08": 3.8,
  "2016-09-09": 8.9,
  "2016-09-10": 29.5,
  "2016-09-11": 15.2,
  "2016-09-12": 26.4,
  "2016-09-13": 30.5,
  "2016-09-14": 170.2,
  "2016-09-15": 85.1,
  "2016-09-16": 15.5,
  "2016-09-17": 5.8,
  "2016-09-18": 10.7,
  "2016-09-19": 6.4,
  "2016-09-20": 10.9,
  "2016-09-21": 25.9,
  "2016-09-22": 19.0,
```


3. HTTP://127.0.0.1:5000/api/v1.0/precipitation - showing dates and precipitation between 24/08/2016 and 22/09/2016 (complete output to 23/08/2017.

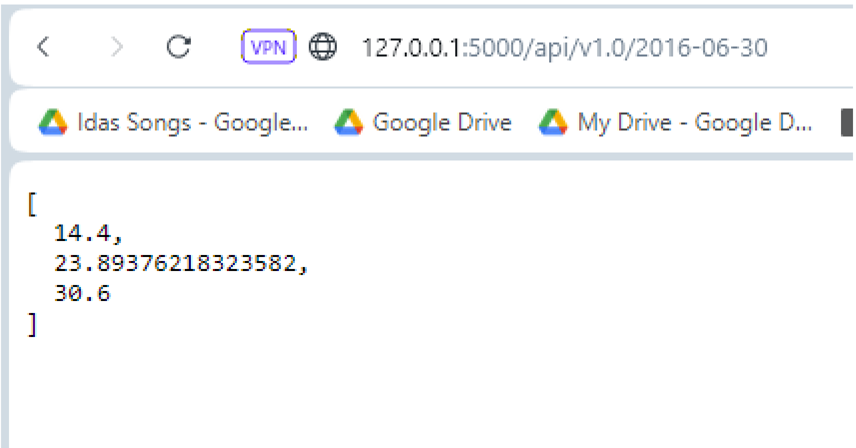



```
[
  "USC00519397",
  "USC00513117",
  "USC00514830",
  "USC00517948",
  "USC00518838",
  "USC00519523",
  "USC00519281",
  "USC00511918",
  "USC00516128"
]
```

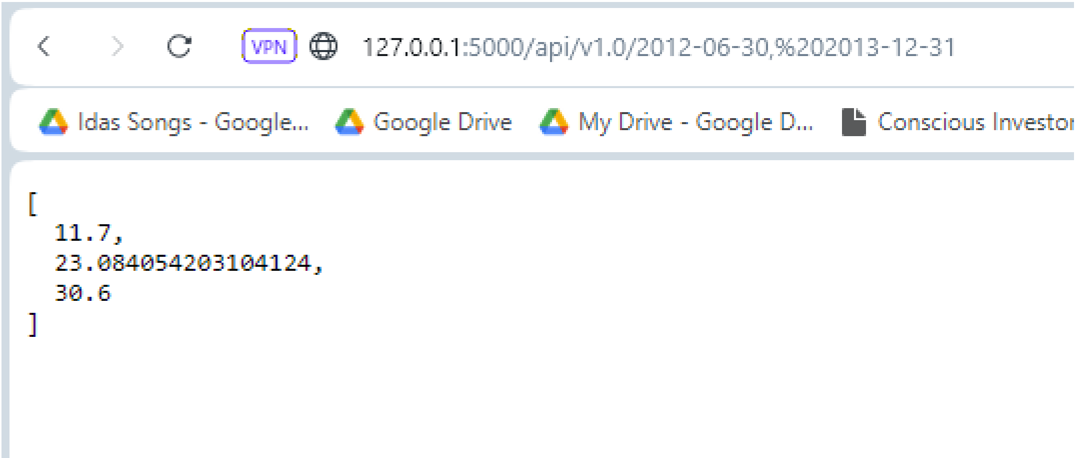

4. HTTP://127.0.0.1:5000/api/v1.0/stations - list of stations



5. HTTP://127.0.0.1:5000/api/v1.0/tobs - list of temperature observations for the last year.



5. HTTP://127.0.0.1:5000/api/v1.0/<start> - Minimum temperature, Average temperature, Maximum temperature on 30/06/20-16.



5. HTTP://127.0.0.1:5000/api/v1.0/<start> - Minimum temperature, Average temperature, Maximum temperature on between 30/06/2012 and 31/12/2013.

Conclusion

This climate analysis I conducted provides valuable insights from trip planning. I now clearly understand precipitation trends and temperature observations in the region. The identified station with the most data will be a valuable resource for tracking weather patterns during my vacation.