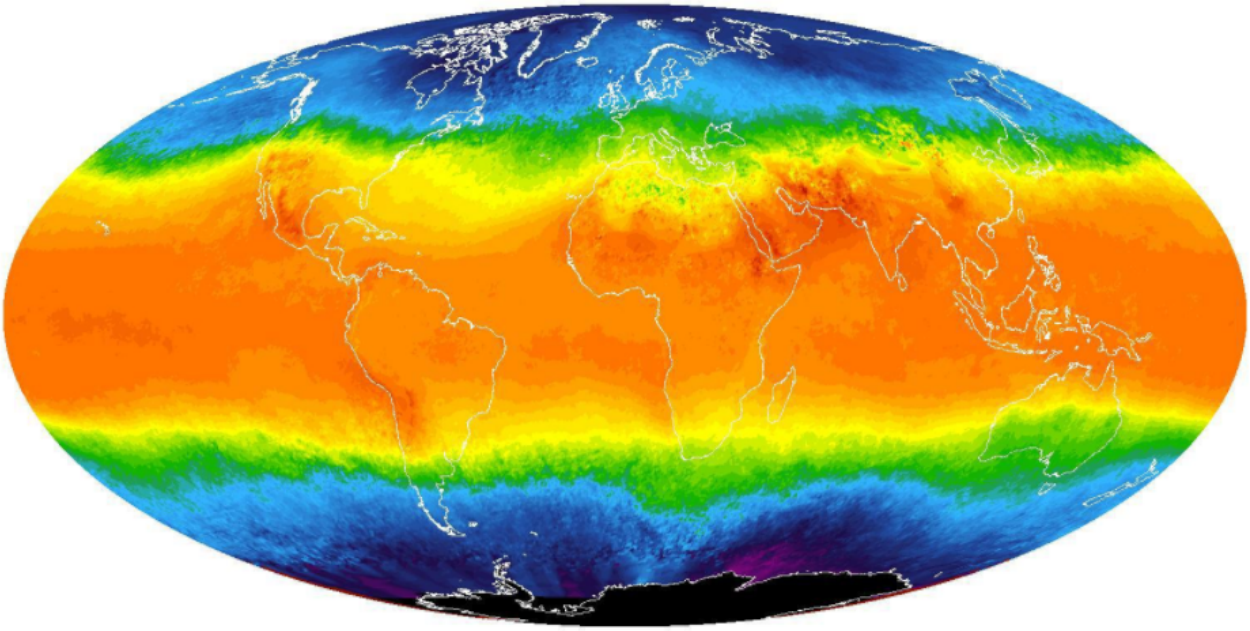
Exploring Weather Trends
Udacity Nanodegree 1st Project



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1. Introduction

In this project, we will analyze local and global temperature data and compare the temperature trends where we live and favorite cities to overall global temperature trends.

2. Data Extraction

In this section, We will be using SQL for data extraction.

2.1. City Selection

Starting, First need to find the city which is closest to where I live. In order to do this, I wrote a SQL query to retrieve the cities in Egypt:

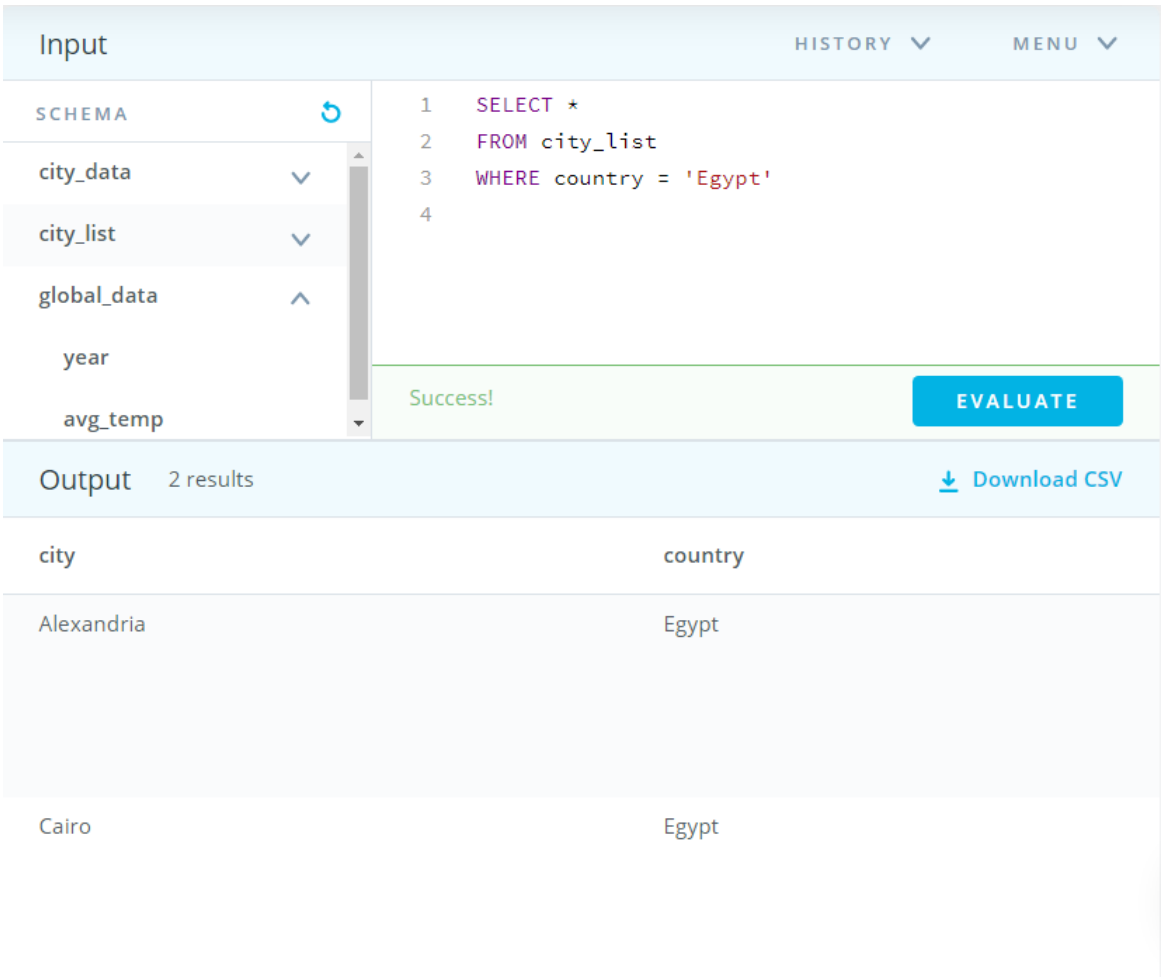

Figure 1: SQL query (Local City)

Two cities appear for the country of Egypt. So, I choose Cairo city as It's the closest city to where I live.

2.2. Extracting global Data

Now, It's time to extract temperature data for Cairo city using the following SQL query:

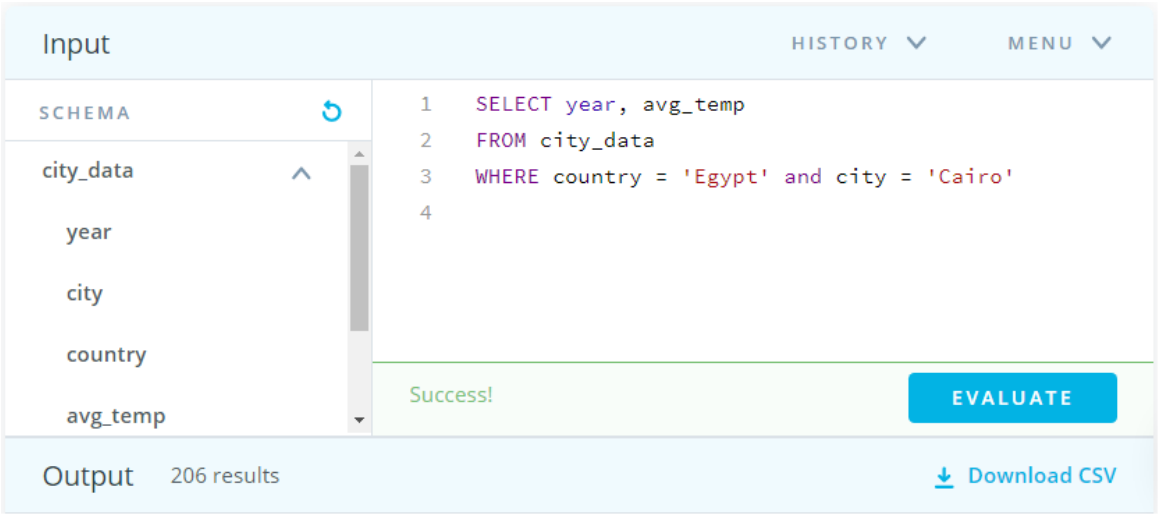

Figure 2: SQL query (Cairo City Data)

This will return 206 results from 1808 to 2013.

2.3. Extracting Cairo Data

Similarly, We use SQL query to extract global temperature data as follows:

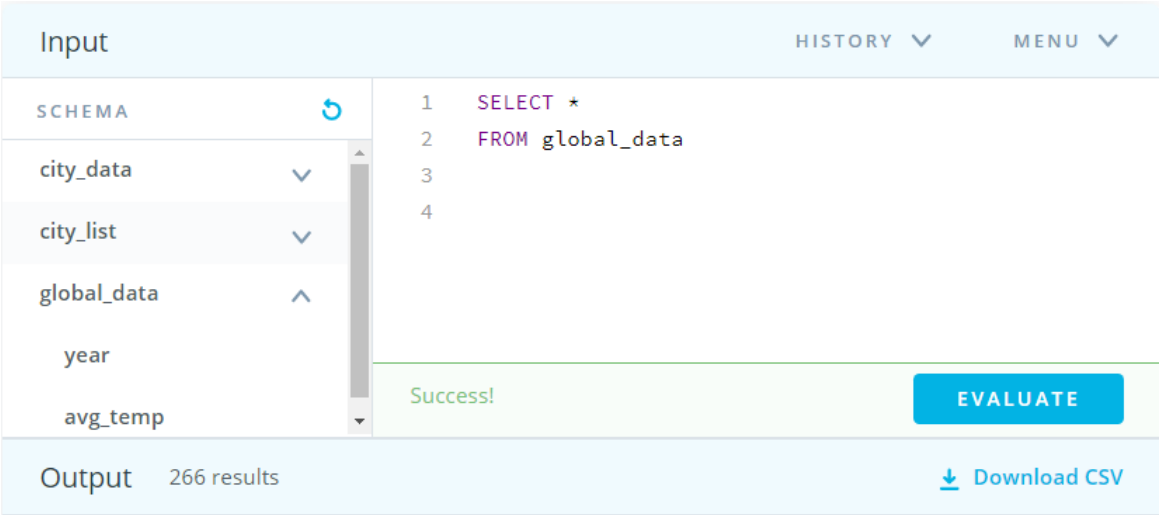

Figure 3: SQL query (Global Data)

This will return 206 results from 1750 to 2015.

3. Data Reading and Calculations

Likewise previously, I extracted the data for Athens and Madrid cities to observe their trends in temperature as well as Cairo city and the Globe. We will manipulate and deal with data, Using Pandas and Matplotlib libraries in Python.

3.1. Moving Average

Firstly, I read the CSV files with the following code :

```
globaltemp = pd.read_csv('globaldata.csv')
citytemp1 = pd.read_csv('cairodata.csv')
citytemp2 = pd.read_csv('athensdata.csv')
citytemp3 = pd.read_csv('madriddata.csv')
```

To observe the trends in temperature I calculated Moving Average (MA) and I used 10 years Moving Average to get a smooth line chart :

```
glb_mv_avg = globaltemp['avg_temp'].rolling(10).mean()
local_mv_avg1 = citytemp1['avg_temp'].rolling(10).mean()
local_mv_avg2 = citytemp2['avg_temp'].rolling(10).mean()
local_mv_avg3 = citytemp3['avg_temp'].rolling(10).mean()
```

4. Data Visualization

Now, I'm able to plot the data to show a comparison between local cities average temperatures and the global average temperature. This done by plotting the years range on the x-axis and the moving average temperatures on the y-axis. after using the following code with Python:

```
plt.style.use('seaborn')

plt.plot(globaltemp['year'], glb_mv_avg, label='Global')
plt.plot(citytemp1['year'], local_mv_avg1, label='Cairo')
plt.plot(citytemp2['year'], local_mv_avg2, label='Athens')
plt.plot(citytemp3['year'], local_mv_avg3, label='Madrid')
```

```
plt.legend( loc='center right')

plt.xlabel("Years")
plt.ylabel("Temperature ( C )")
plt.title("Cities Average Temperatures")
plt.xticks(fontsize=14)
plt.yticks(fontsize=14)

plt.show()
```

The following line chart is generated :

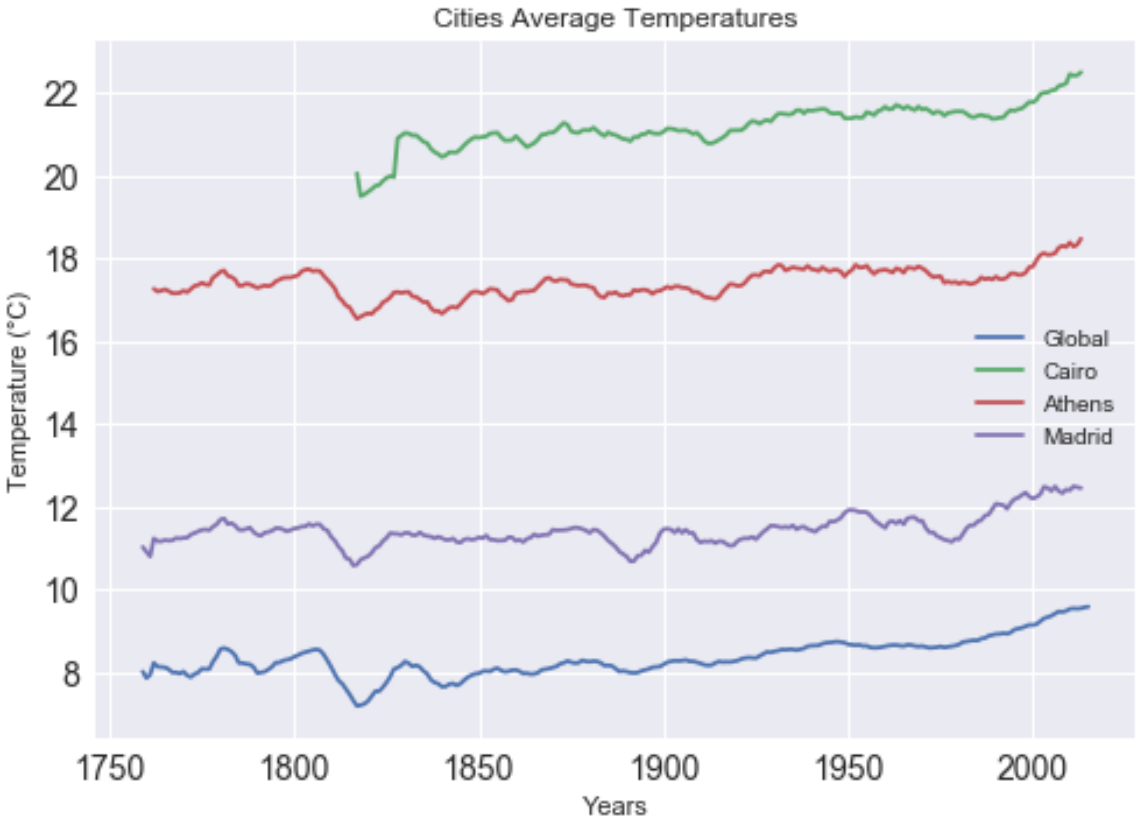

Figure 4: Global VS Cities temperature Changes

5. Observations

According to line chart, The following observations can be deduced :

1) Cairo's weather is much warmer than the global average considering that the temperature has always been greater in the past couple hundred years.

2)in both cases, We can see that the average temperature is increasing throughout the entire time-frame.

3)A significant rise in the yearly average temperature can be observed for Cairo in past couple of decades starting from 1990 upwards.

4) the yearly average temperature seems to be increasing abnormally on a global scale. The same can be noticed when looking at the chart at figure 4 where It's evident that the global average temperature had ranged around the 8°C until 1890. from then on, We notice an uptrend in the temperature rise.