

# Explore Weather Trends

## Overview 📖

In this project, I analyzed local in Riyadh and global temperature data and I compared the temperature trends local in Riyadh and global temperature trends.

I built a website through which the user chooses his city and shows it the city's data. The data is processed and the moving average of the user's city and the world is calculated, and his line chart is displayed and allowed to write his observations about the similarities and/or differences in the trends and then save the web page as a PDF file.

## DEMO

It is was implemented using SQL, Python language, Pandas, Matplotlib, and Streamlit.

## The Road Ahead 🛣️

I break the notebook into separate steps.

- STEP 1: Data Extraction.
- STEP 2: Data Manipulation.
- STEP 3: Data Visualization.
- STEP 4: Observations.

## Data Extraction 🔍

I extracted data from a database using SQL query on the SQL Workspace in the Udacity classroom.

### SQL query

SQL query to retrieve the cities in Saudi Arabia in the `city_list` table. [Screenshot](#)

```
SELECT *
FROM city_list
WHERE country = 'Saudi Arabia';
```

SQL query to retrieve the average temperatures data for the city of Riyadh in the `city_data` table. [Screenshot](#)

```
SELECT year, avg_temp
FROM city_data
WHERE city = 'Riyadh';
```

SQL query to retrieve the average global temperatures in the `global_data` table. [Screenshot](#)

```
SELECT *
FROM global_data;
```

## Data Manipulation ⚙️

### Read CSV Files and Removing missing values

```
In [1]: import pandas as pd

local_data = pd.read_csv("/content/local_data.csv")
global_data = pd.read_csv("/content/global_data.csv")
```

```
In [2]: local_data = (local_data.dropna()).reset_index(drop=True)
local_data.head(20)
```

```
Out[2]:
```

	year	avg_temp
0	1843	24.74
1	1844	15.45
2	1845	20.82
3	1848	24.56
4	1849	24.80
5	1850	24.34
6	1851	25.03
7	1852	24.85
8	1853	24.93
9	1854	24.72
10	1855	24.92
11	1856	24.57
12	1857	24.26
13	1858	25.01
14	1859	24.95
15	1860	24.94
16	1861	24.13
17	1862	23.77
18	1863	24.28
19	1864	25.03

```
In [3]: global_data.head(20)
```

```
Out[3]:
```

	year	avg_temp
0	1750	8.72
1	1751	7.98
2	1752	5.78
3	1753	8.39
4	1754	8.47
5	1755	8.36
6	1756	8.85
7	1757	9.02
8	1758	6.74
9	1759	7.99
10	1760	7.19
11	1761	8.77
12	1762	8.61
13	1763	7.50
14	1764	8.40
15	1765	8.25
16	1766	8.41
17	1767	8.22
18	1768	6.78
19	1769	7.69

### Calculating Moving Averages

```
In [4]: local_data['ma_local'] = local_data['avg_temp'].rolling(window=20).mean()
global_data['ma_global'] = global_data['avg_temp'].rolling(window=20).mean()
```

```
In [5]: local_data.tail(20)
```

```
Out[5]:
```

	year	avg_temp	ma_local
149	1994	26.08	25.4760
150	1995	25.64	25.5060
151	1996	26.28	25.5715
152	1997	25.49	25.5465
153	1998	26.73	25.5855
154	1999	26.92	25.6215
155	2000	26.55	25.6575
156	2001	26.67	25.6935
157	2002	26.44	25.7845
158	2003	26.62	25.8730
159	2004	26.20	25.9305
160	2005	26.27	25.9790
161	2006	26.24	26.0230
162	2007	26.49	26.0290
163	2008	26.21	26.0400
164	2009	26.71	26.1230
165	2010	27.37	26.2065
166	2011	26.40	26.2550
167	2012	26.83	26.3780
168	2013	27.78	26.4960

```
In [6]: global_data.tail(20)
```

```
Out[6]:
```

	year	avg_temp	ma_global
246	1996	9.04	8.9465
247	1997	9.20	8.9640
248	1998	9.52	9.0055
249	1999	9.29	9.0335
250	2000	9.20	9.0445
251	2001	9.41	9.0565
252	2002	9.57	9.1030
253	2003	9.53	9.1280
254	2004	9.32	9.1595
255	2005	9.70	9.2115
256	2006	9.53	9.2465
257	2007	9.73	9.2835
258	2008	9.43	9.2950
259	2009	9.51	9.3245
260	2010	9.70	9.3480
261	2011	9.52	9.3650
262	2012	9.51	9.3985
263	2013	9.61	9.4355
264	2014	9.57	9.4620
265	2015	9.83	9.4860

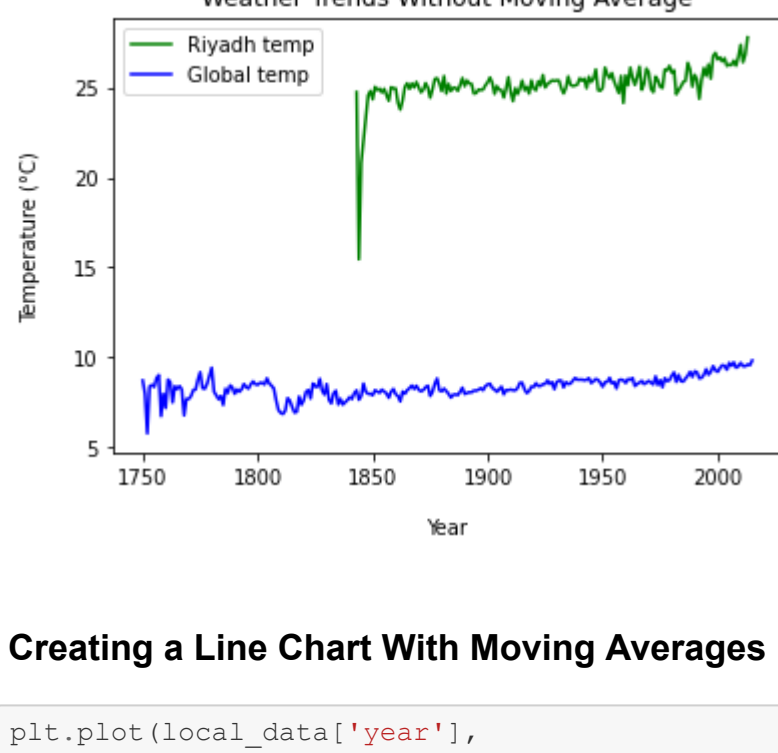
## Data Visualization ☑️

### Creating a Line Chart Without Moving Averages

```
In [7]: import matplotlib.pyplot as plt

plt.plot(local_data['year'],
         local_data['avg_temp'],
         label='Riyadh temp', color= 'g')
plt.plot(global_data['year'],
         global_data['avg_temp'],
         label='Global temp', color= 'b')

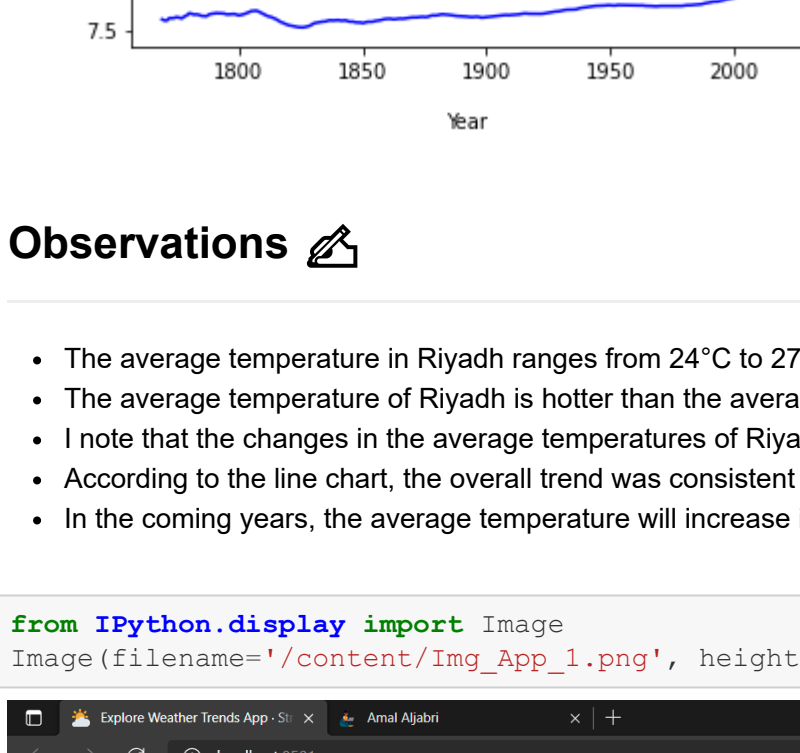
plt.legend()
plt.title('Weather Trends Without Moving Average')
plt.xlabel('\nYear')
plt.ylabel('Temperature (°C)\n')
plt.show()
```



### Creating a Line Chart With Moving Averages

```
In [8]: plt.plot(local_data['year'],
         local_data['ma_local'],
         label='Riyadh temp', color= 'g')
plt.plot(global_data['year'],
         global_data['ma_global'],
         label='Global temp', color= 'b')

plt.legend()
plt.title('Weather Trends With Moving Average')
plt.xlabel('\nYear')
plt.ylabel('Temperature (°C)\n')
plt.show()
```



## Observations 📝

- The average temperature in Riyadh ranges from 24°C to 27°C, while the average world temperature ranges from 6°C to 9°C.
- The average temperature of Riyadh is hotter than the average temperature in the world.
- I note that the changes in the average temperatures of Riyadh and the average temperatures of the world have changed similarly.
- According to the line chart, the overall trend was consistent over a long period.
- In the coming years, the average temperature will increase in both Riyadh and the world.

```
In [9]: from IPython.display import Image
Image(filename='/content/Img_App_1.png', height=400)
```

```
Out[9]:
```

```
In [10]: Image(filename='/content/Img_App_2.png', height=400)
```

```
Out[10]:
```

```
In [11]: Image(filename='/content/Img_App_3.png', height=400)
```

```
Out[11]:
```

```
In [12]: Image(filename='/content/Img_App_4.png', height=400)
```

```
Out[12]:
```

In [13]: Image(filename='/content/Img\_App\_5.png', height=400)

Out[13]:

