# Data Analyst NanoDegree Project 1

## Exploring Weather Trends

# SQL code used to collect data

**SELECT cd.*, gd.avg_temp global_avg_temp**

**From city_data cd**

**JOIN global_data gd**

**ON cd.year = gd.year**

**WHERE city = 'Cairo'**

In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import sys
```

In [2]:

```
sys.version
```

Out[2]:

```
'3.7.3 (default, Apr 24 2019, 15:29:51) [MSC v.1915 64 bit (AMD64)]'
```

In [7]:

```
joined_data = pd.read_csv('D:\Python\Data Analyst\Weather trends\joined results.csv')
joined_data.head()
```

Out[7]:

| | year | city | country | local_avg_temp | global_avg_temp |
|---|---|---|---|---|---|
| **0** | 1808 | Cairo | Egypt | 17.11 | 7.63 |
| **1** | 1809 | Cairo | Egypt | 19.87 | 7.08 |
| **2** | 1810 | Cairo | Egypt | 19.93 | 6.92 |
| **3** | 1811 | Cairo | Egypt | 20.00 | 6.86 |
| **4** | 1812 | Cairo | Egypt | 19.93 | 7.05 |

In [8]:

```
joined_data.drop(columns = ['city','country'], inplace=True)
```

In [9]:

```
joined_data.head()
```

Out[9]:

| | year | local_avg_temp | global_avg_temp |
|---|---|---|---|
| **0** | 1808 | 17.11 | 7.63 |
| **1** | 1809 | 19.87 | 7.08 |
| **2** | 1810 | 19.93 | 6.92 |
| **3** | 1811 | 20.00 | 6.86 |
| **4** | 1812 | 19.93 | 7.05 |

In [10]:

```
joined_data.set_index(joined_data['year'],inplace = True)
joined_data.drop(columns = 'year', inplace = True)
joined_data.head()
```

Out[10]:

| year | local_avg_temp | global_avg_temp |
|---|---|---|
| **1808** | 17.11 | 7.63 |
| **1809** | 19.87 | 7.08 |
| **1810** | 19.93 | 6.92 |
| **1811** | 20.00 | 6.86 |
| **1812** | 19.93 | 7.05 |

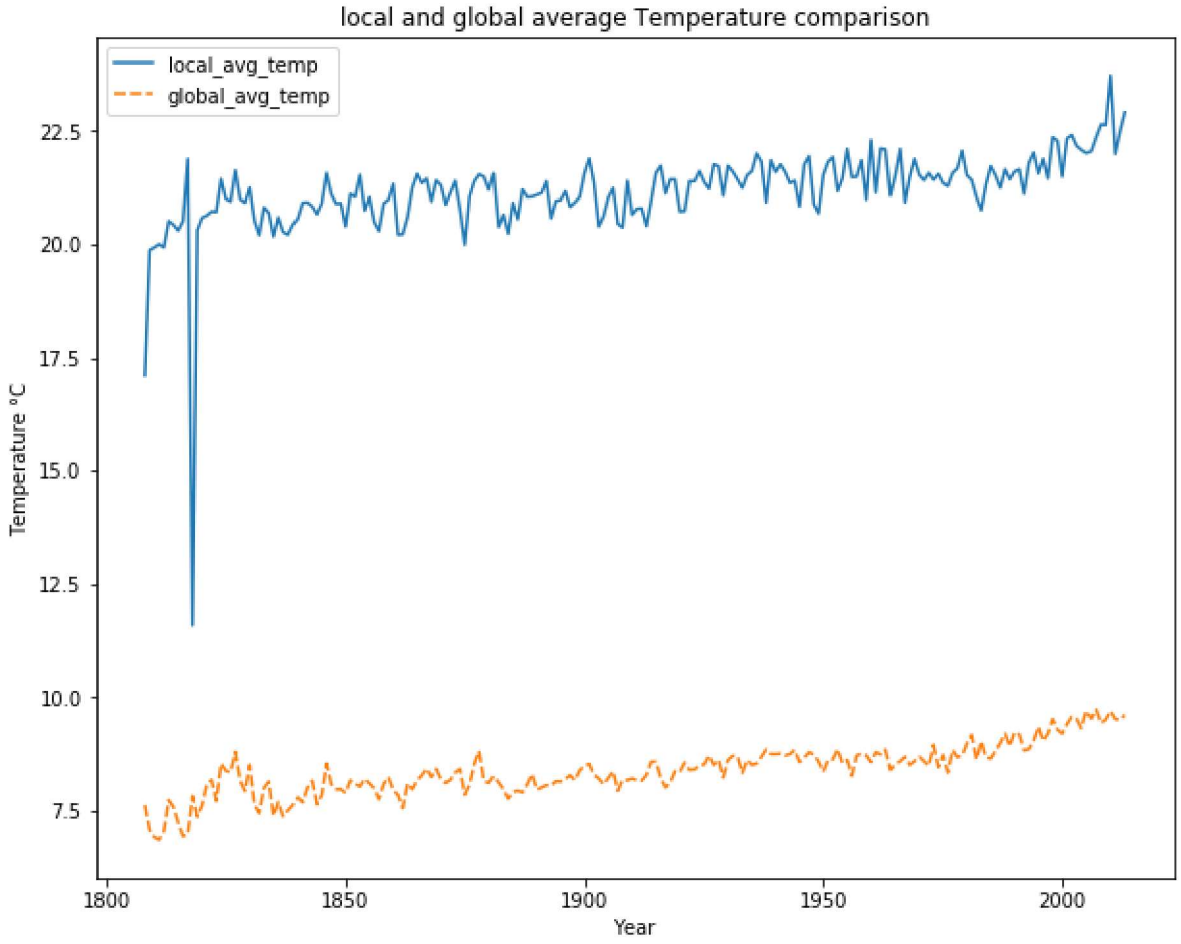
In [19]:

```
plt.figure(1,(10,8))

sns.lineplot(data = joined_data).set(xlabel='Year', ylabel='Temperature °C',
                                     title='local and global average Temperature comparisor
```

Out[19]:

```
[Text(0, 0.5, 'Temperature °C'),
 Text(0.5, 0, 'Year'),
 Text(0.5, 1.0, 'local and global average Temperature comparison')]
```



In [20]:

```
#creating 5 year  moving average
joined_data['local_MA_5'] = joined_data['local_avg_temp'].rolling(window=5).mean()
joined_data['global_MA_5'] = joined_data['global_avg_temp'].rolling(window=5).mean()
joined_data.head(10)
```

Out[20]:

| year | local_avg_temp | global_avg_temp | local_MA_5 | global_MA_5 |
|---|---|---|---|---|
| **1808** | 17.11 | 7.63 | NaN | NaN |
| **1809** | 19.87 | 7.08 | NaN | NaN |
| **1810** | 19.93 | 6.92 | NaN | NaN |
| **1811** | 20.00 | 6.86 | NaN | NaN |
| **1812** | 19.93 | 7.05 | 19.368 | 7.108 |
| **1813** | 20.51 | 7.74 | 20.048 | 7.130 |
| **1814** | 20.43 | 7.59 | 20.160 | 7.232 |
| **1815** | 20.30 | 7.24 | 20.234 | 7.296 |
| **1816** | 20.51 | 6.94 | 20.336 | 7.312 |
| **1817** | 21.88 | 6.98 | 20.726 | 7.298 |

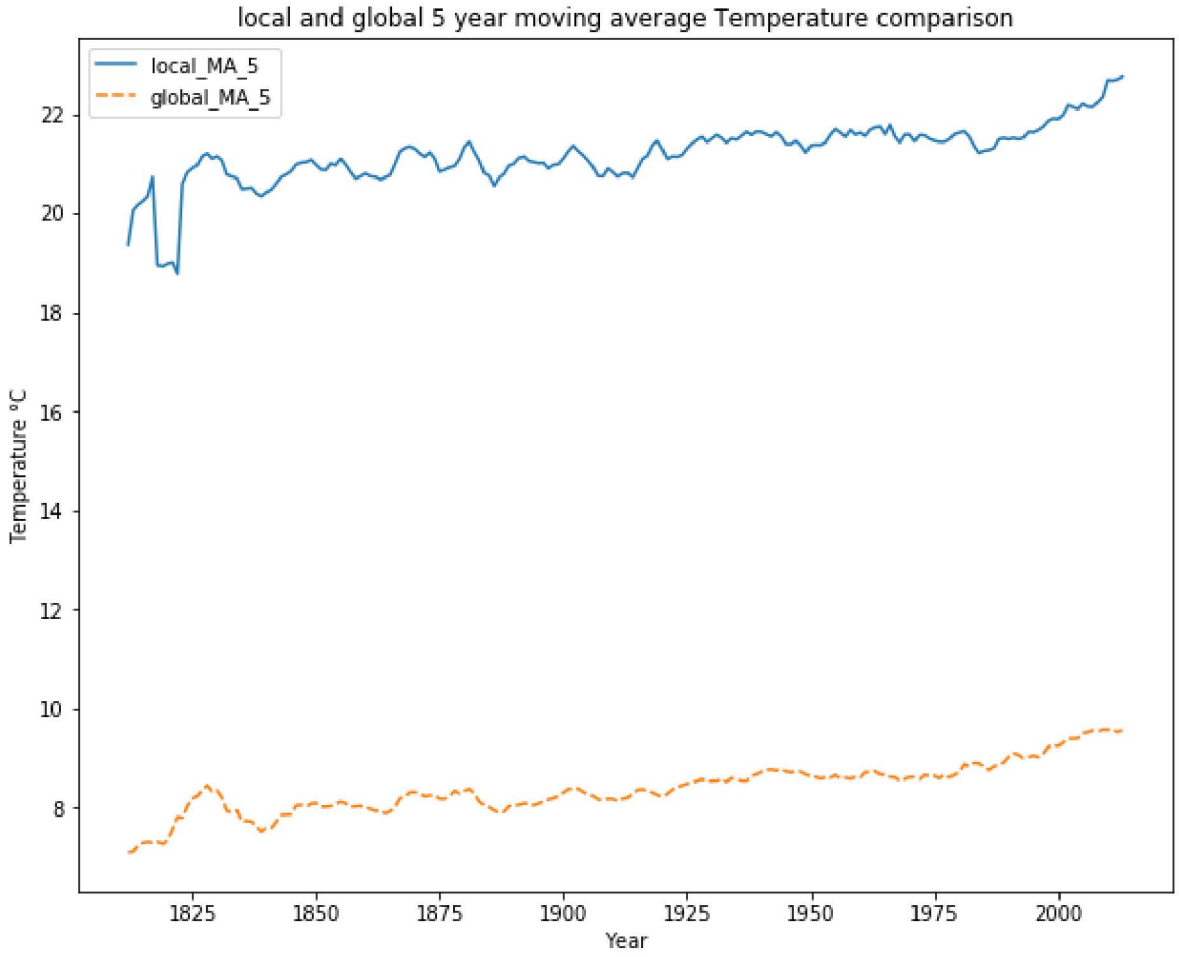
In [21]:

```
plt.figure(1,(10,8))

sns.lineplot(data = joined_data[['local_MA_5', 'global_MA_5']]).set(xlabel='Year', ylabel='
                                    title='local and global 5 year moving average Temperat
```

Out[21]:

```
[Text(0, 0.5, 'Temperature °C'),
 Text(0.5, 0, 'Year'),
 Text(0.5, 1.0, 'local and global 5 year moving average Temperature comparis
on')]
```



In [139]:

```
print('The mean local temperature is', np.round(joined_data['local_avg_temp'].mean(), 2),'C
print('The mean global temperature is',np.round(joined_data['global_avg_temp'].mean(), 2),'
```

```
The mean local temperature is 21.17 C
The mean global temperature is 8.4 C
```

In [22]:

```
#creating 10 year moving average
joined_data['local_MA_10'] = joined_data['local_avg_temp'].rolling(window=10).mean()
joined_data['global_MA_10'] = joined_data['global_avg_temp'].rolling(window=10).mean()
joined_data.head(15)
```

Out[22]:

| year | local_avg_temp | global_avg_temp | local_MA_5 | global_MA_5 | local_MA_10 | global_MA_10 |
|---|---|---|---|---|---|---|
| **1808** | 17.11 | 7.63 | NaN | NaN | NaN | NaN |
| **1809** | 19.87 | 7.08 | NaN | NaN | NaN | NaN |
| **1810** | 19.93 | 6.92 | NaN | NaN | NaN | NaN |
| **1811** | 20.00 | 6.86 | NaN | NaN | NaN | NaN |
| **1812** | 19.93 | 7.05 | 19.368 | 7.108 | NaN | NaN |
| **1813** | 20.51 | 7.74 | 20.048 | 7.130 | NaN | NaN |
| **1814** | 20.43 | 7.59 | 20.160 | 7.232 | NaN | NaN |
| **1815** | 20.30 | 7.24 | 20.234 | 7.296 | NaN | NaN |
| **1816** | 20.51 | 6.94 | 20.336 | 7.312 | NaN | NaN |
| **1817** | 21.88 | 6.98 | 20.726 | 7.298 | 20.047 | 7.203 |
| **1818** | 11.60 | 7.83 | 18.944 | 7.316 | 19.496 | 7.223 |
| **1819** | 20.31 | 7.37 | 18.920 | 7.272 | 19.540 | 7.252 |
| **1820** | 20.58 | 7.62 | 18.976 | 7.348 | 19.605 | 7.322 |
| **1821** | 20.63 | 8.09 | 19.000 | 7.578 | 19.668 | 7.445 |
| **1822** | 20.72 | 8.19 | 18.768 | 7.820 | 19.747 | 7.559 |

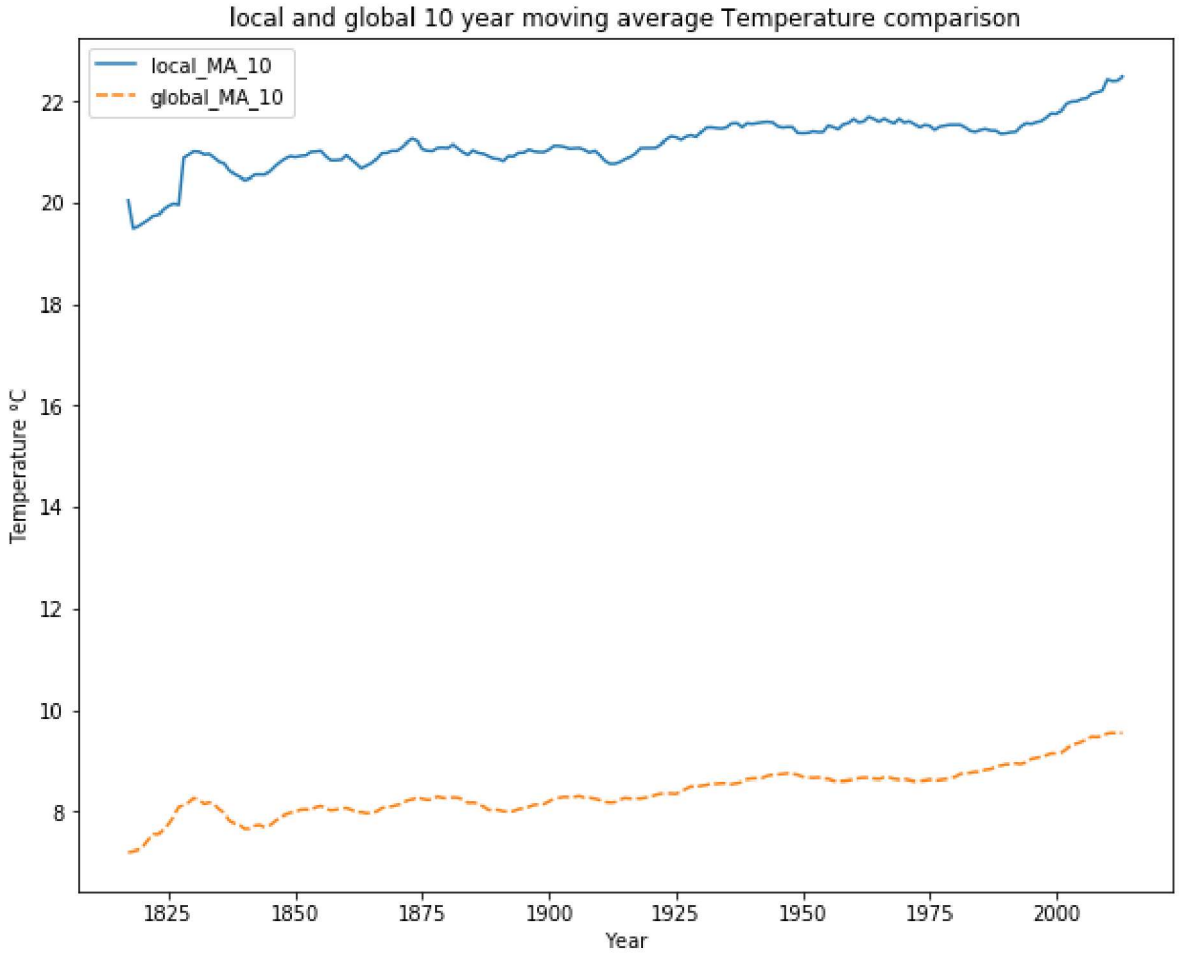
In [23]:

```
plt.figure(1,(10,8))

sns.lineplot(data = joined_data[['local_MA_10', 'global_MA_10']]).set(xlabel='Year', ylabel
                                    title='local and global 10 year moving average Tempera
```

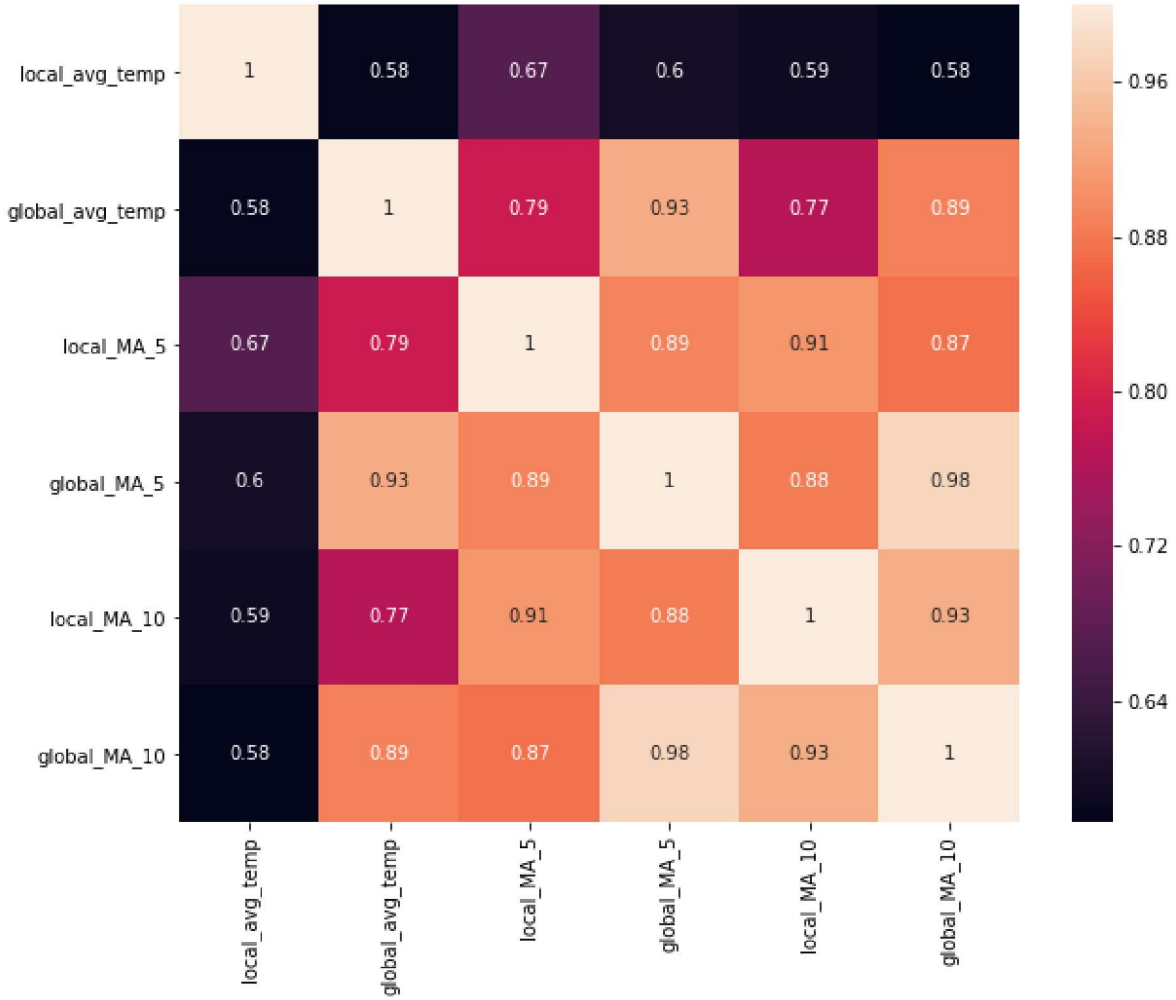
Out[23]:

```
[Text(0, 0.5, 'Temperature °C'),
 Text(0.5, 0, 'Year'),
 Text(0.5, 1.0, 'local and global 10 year moving average Temperature compari
son')]
```



In [24]:

```
#creating correlation heatmap between the local temperature 5 year moving average
#and the global temperature 5 year moving average
plt.figure(1,(10,8))
corr = joined_data.corr()
heat_map = sns.heatmap(data=corr,annot = True)
```




## 1.Is your city hotter or cooler on average compared to the global average? Has the difference been consistent over time?

A: Temperature in my city is hotter on average than the global average by quite a large margin and the difference has always been consistent.

## How do the changes in your city's temperatures over time compare to the changes in the global average?

A: The changes in my city's temperature and the global average are almost the same (see above or below for the correlation coefficient).

## What does the overall trend look like? Is the world getting hotter or cooler? Has the trend been consistent over the last few hundred years?

A: The world is defiantly getting hotter (despite the climate change skeptics' efforts) and has been for the last few hundred years.

## Is there any differences in temperature's variation between your city and the global average?

A: My city's temperature on average has more variance than the global average.

## What's the correlation coefficient?

A: the correlation coefficient between the local and global average temperature stands at *0.58*. However, the correlation coefficient between the rolling average of 5 years is higher standing at *0.89*. Subsequently, the correlation coefficient between the rolling 10 years average stands at a maximum of *0.93*.

One can only draw the conclusion that with more moving average theresholds , the correlation coefficient grows larger and the correlation becomes more apparent.