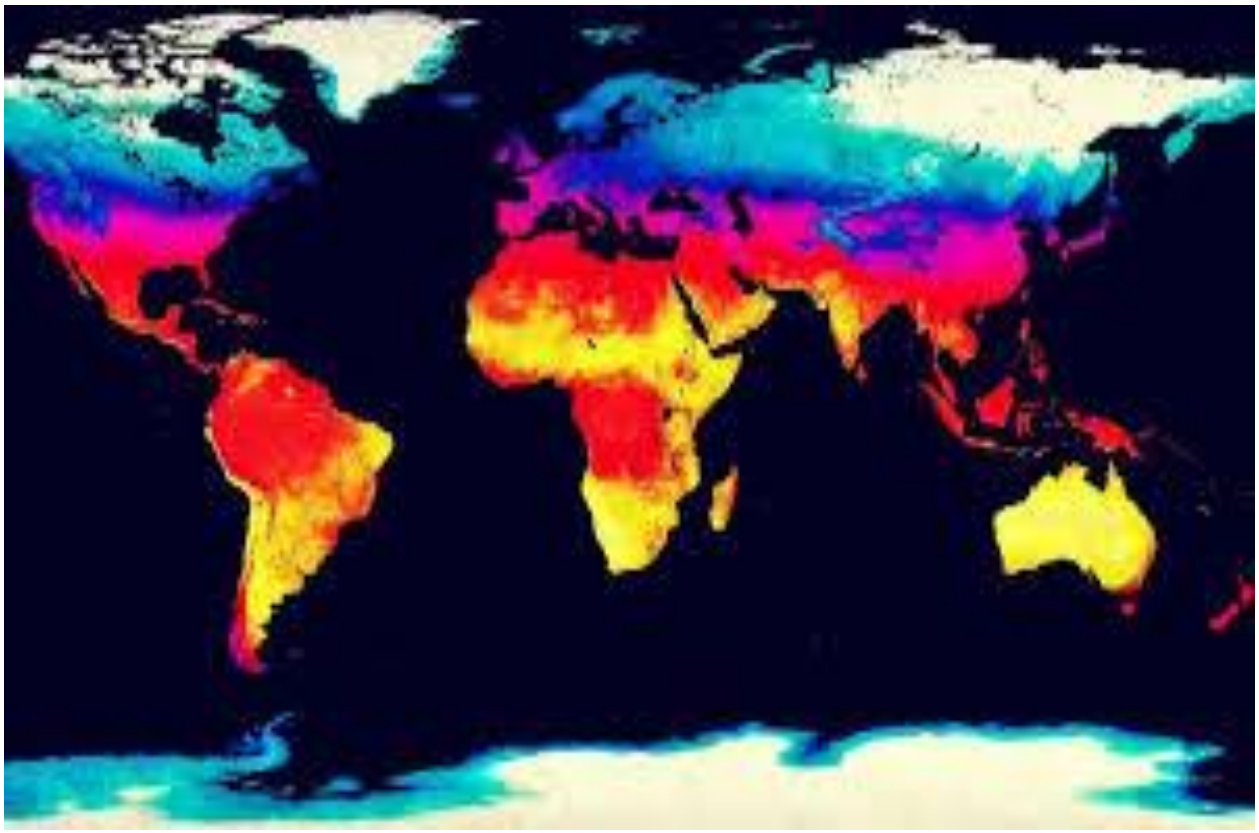
EXPLORING WEATHER TRENDS



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Introduction

- This dataset is a collection of Avgerage temprerature of world and cities with different countries.
- It consists of 218 entries of years for local data(1796-2013) and 266(1750-2016)
- Our objective is to find ot What are trends between these 2 temp.

Goals

- For Data Extarction SQL queries to use.
- Calculation of moving average to smooth out the temp data over a specified period of time by creating a constantly updated average temp.
- Drawing a line chart with legends and labels to compare the temperature trends between city and World.
- Finding the relevant Conclusions about the data visualization.

Tools Used

- 1.SQL - To extract data from the database through query.
- 2.Python – Calculating Moving average and plotting the line chart.
- 3.Anaconda - Jupyter Notebook – For writing python code and making observation.

DATA EXTRACTION –

SELECT * FROM city_list WHERE city LIKE 'Hyd%' AND country LIKE 'Ind%' -- To find the data of nearest city

SELECT * FROM city_data WHERE city = 'Hyderabad' and country = 'India' -- To Find City’s average temperature across years

SELECT * FROM global_data --- To Find World average temperature across years

Type *Markdown* and LaTeX: α^2

- Set up enviornment

In [1]:

```
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
```

DATA WRANGLING

- Data manipulation i.e Discovering NULL entries and replacing them with some values , finding duplicates and handling them.
- Local data have 7 null entries which are present in avg_temp column.These are successfully replaced with mean of avg temp column.
- There are 266 entries in the global data and 218 entries in the local data but ranges should be same so data selected from range 1796-2003 for both datasets so that our line chart can compare with same time frames.
- Dropped city and country column from global database which are not requied.

In [2]:

```
# Loading local and global temp data
df_local = pd.read_csv("localdata.txt")
df_global = pd.read_csv("Global Data.txt")
```

In [3]:

```
#finding NULL entries
df_local.isnull().sum()
```

Out[3]:

```
year        0
city        0
country     0
avg_temp    7
dtype: int64
```

In [4]:

```
#finding unique entries in the local data
df_local.nunique()
```

Out[4]:

```
year        218
city          1
country       1
avg_temp    133
dtype: int64
```

In [5]:

```
#null entries in global data
df_global.isnull().sum()
```

Out[5]:

```
year        0
avg_temp    0
dtype: int64
```

In [6]:

```
#finding no of rows and columns in both the data set
df_local.shape,df_global.shape
```

Out[6]:

```
((218, 4), (266, 2))
```

In [7]:

```
#filling null values with the mean of avg_temp column
df_local["avg_temp"].fillna(df_local["avg_temp"].mean(),inplace = True)
```

In [8]:

```
#conforming the changes
df_local.isnull().sum()
```

Out[8]:

```
year        0
city        0
country     0
avg_temp    0
dtype: int64
```

In [9]:

```
#deleting country and city data from local dataframe
df_local.drop(["city","country"],axis = 1,inplace = True)
```

In [10]:

```
#conforming the changes
df_local.head()
```

Out[10]:

	year	avg_temp
0	1796	26.53
1	1797	27.48
2	1798	26.20
3	1799	26.84
4	1800	26.88

In [11]:

```
#Analysing on lenght and assigning to a new data set as we are provided with a local data o
new_global = df_global[(df_global.year >= 1796) & (df_global.year <= 2013)]
```

In [12]:

```
new_global.shape
```

Out[12]:

```
(218, 2)
```

In [13]:

```
df_local.shape
```

Out[13]:

```
(218, 2)
```

In [14]:

```
#Lengths must match to compare
df_local.columns == df_global.columns
```

Out[14]:

```
array([ True,  True])
```

CALCULATING MOVING AVARAGE

- Moving Average are Calculated for 20 years.
- In pandas we have a function called rolling average function which calculates unweighted means of last n values which is
  applied row by row so that we get a series of Averages.
- In excel same way we aggregate over a defined number of rows.

In [15]:

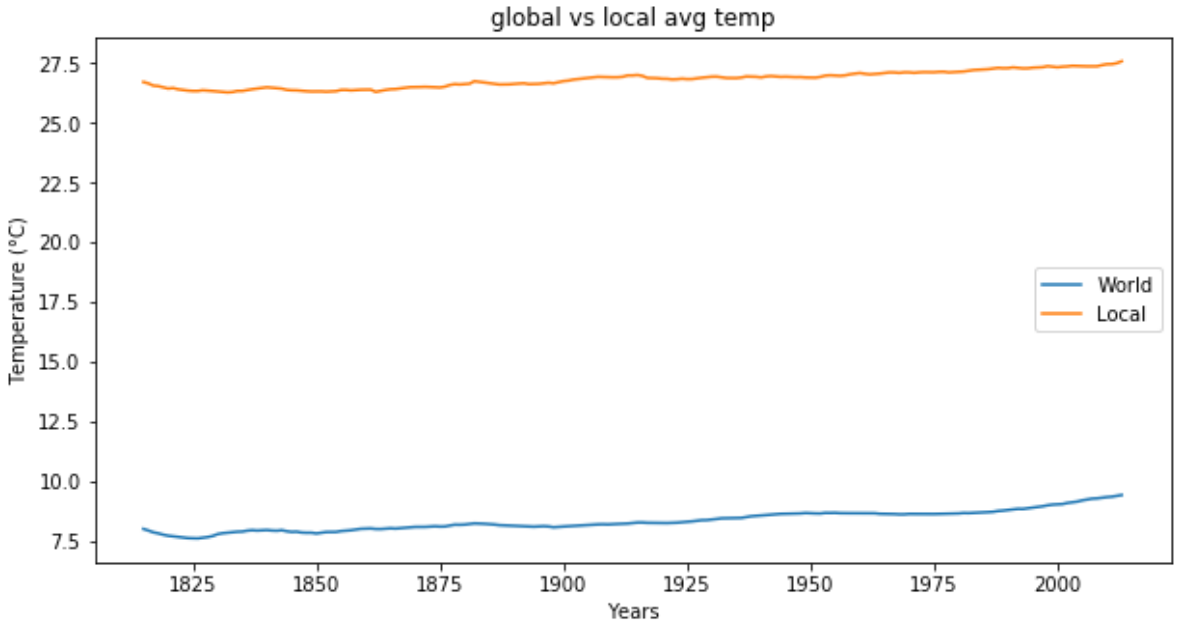
```
glb_mv_avg = new_global['avg_temp'].rolling(20).mean()
local_mv_avg = df_local['avg_temp'].rolling(20).mean()
```

DATA VISUALIZATION

- Data visualization is the graphical representation of information and data.
- To understand trends,pattern,outlier it is used.
- matplotlib.pyplot's plot function is used here for visualization.

In [29]:

```
#plotting with moving average
plt.figure(figsize=[10,5])
plt.plot(new_global['year'],glb_mv_avg,label='World')
plt.plot(df_local['year'],local_mv_avg,label='Local')
plt.legend()
plt.xlabel("Years")
plt.ylabel("Temperature (°C)")
plt.title("global vs local avg temp")
plt.show()
```



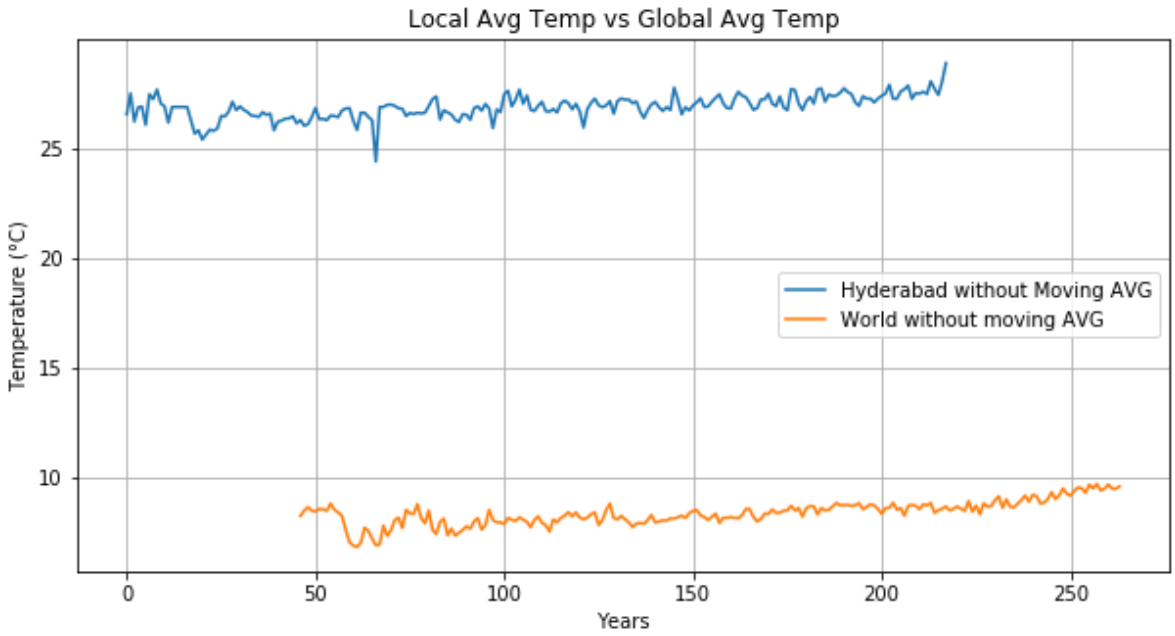
Conclusions

Moving average significance

- Moving Averge makes the lines smooth to observe long term trends and not getting lost in yearly fluctuation.
- Below plotted the line chart without moving average to see the differences.

In [17]:

```
#plotting the line chart
plt.figure(figsize=[10,5])
plt.grid(True)
plt.plot(df_local['avg_temp'],label='Hyderabad without Moving AVG')
plt.plot(new_global['avg_temp'],label='World without moving AVG')
plt.legend()
plt.xlabel("Years")
plt.ylabel("Temperature (°C)")
plt.title("Local Avg Temp vs Global Avg Temp")
plt.show();
```

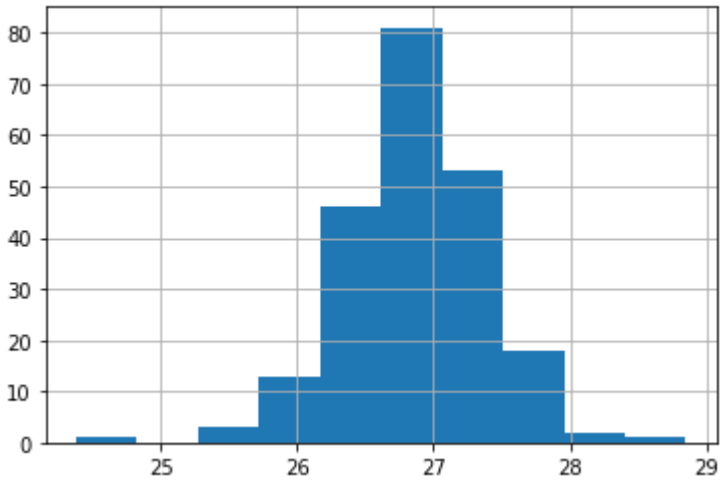


Temperatue Comparison

- The local temp is significantly higher than global temp.
- Local temp data is normal distributed showing 1 outlier 24.38 (°C).
- Local temp is min - 24.38 (°C) and max = 28.85 (°C)
- Minimum temp is 6.86 to max is varies 9.73.
- Range for global data is approx 3(°C) while for local data is approx 4.5(°C).

In [18]:

```
#histogarm plot for local data
df_local["avg_temp"].hist();
```



In [19]:

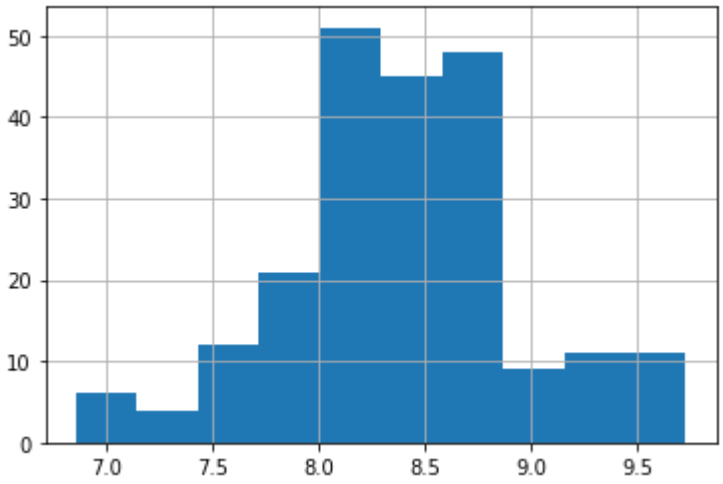
```
df_local.describe()
```

Out[19]:

	year	avg_temp
count	218.000000	218.000000
mean	1904.500000	26.861564
std	63.075352	0.533463
min	1796.000000	24.380000
25%	1850.250000	26.562500
50%	1904.500000	26.861564
75%	1958.750000	27.220000
max	2013.000000	28.850000

In [20]:

```
#histogarm plot for global data
new_global["avg_temp"].hist();
```



In [21]:

```
new_global.describe()
```

Out[21]:

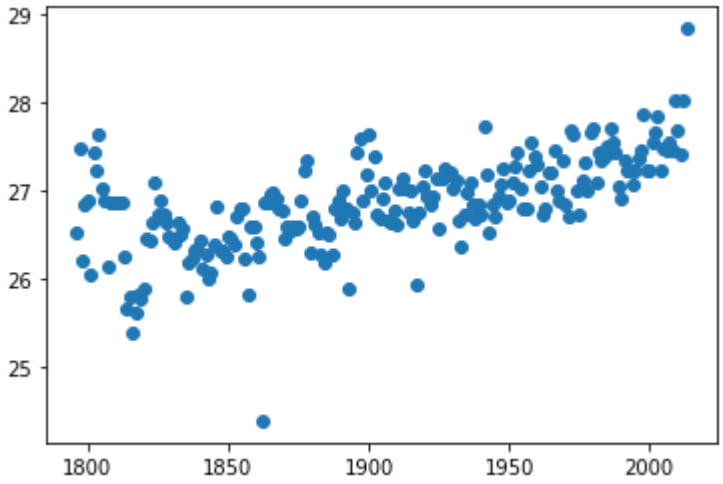
	year	avg_temp
count	218.000000	218.000000
mean	1904.500000	8.403532
std	63.075352	0.548662
min	1796.000000	6.860000
25%	1850.250000	8.092500
50%	1904.500000	8.415000
75%	1958.750000	8.727500
max	2013.000000	9.730000

Calculation correlation coefficent for both data

- Scatter plot shows both the data are positive co related but global data is highly related for that I found out the corr coeff.
- Co-realtion coff for local data is - 0.636
- Co-realtion coff for global data is - 0.7652

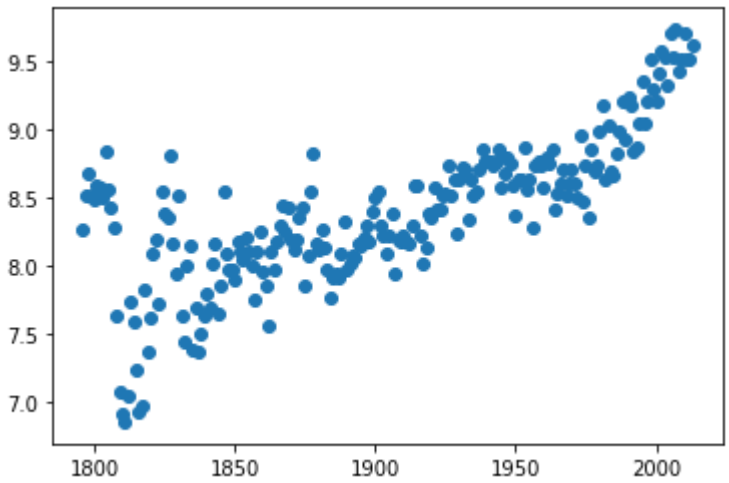
In [22]:

```
#scatter plot for  the  loacal data
plt.scatter(df_local['year'],df_local['avg_temp']);
```



In [23]:

```
#scatter plot for the global data
plt.scatter(new_global['year'],new_global['avg_temp']);
```



corr coeff for global data is in between 0.7 - 1.0 so it is highly co-related i.e global temp is rapidly increasing.

In [24]:

```
#co relation coff for local
corr_local = df_local.corr(method='pearson')
corr_local
```

Out[24]:

	year	avg_temp
year	1.000000	0.636648
avg_temp	0.636648	1.000000

In [25]:

```
#co relation coff for global
corr_global = new_global.corr(method='pearson')
corr_global
```

Out[25]:

	year	avg_temp
year	1.000000	0.765267
avg_temp	0.765267	1.000000

Local avgerage temp is greater than world's avgerage temp.

- Local mean temp - 26.86
- World mean temp - 8.4

In [26]:

```
#avarage temp of delhi
df_local["avg_temp"].mean()
```

Out[26]:

```
26.861563981042664
```

In [27]:

```
#average temp of world
new_global["avg_temp"].mean()
```

Out[27]:

```
8.403532110091742
```