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Overview:

Objective:

To create visualization (Line graph) and describe the variations and similarities between global temperature trends and Bangalore temperature trends.

Tools & Languages:

1. Tools: Anaconda - Spyder, Microsoft Excel
2. Languages: Python & SQL

Steps:

1. Use necessary SQL queries with joins to extract data from database to csv file
2. Curate/ Prepare data for analysis
3. Calculate moving averages for smoothening the trend curve
4. Plot line graph
5. Calculate correlation coefficient
6. Observations

Let's discuss the steps in detail:

Step 1: Use necessary SQL queries with joins to extract data from database to csv file

1. I have taken 'year' & 'avg_temp' data from "gobal_data" table

   ```
   select * from global_data
   ```

2. I have joined "city_list" table with "city_data" table and taken 'year' & 'avg_temp' data for the city I have selected

   ```
   select * from city_list where country like 'Ind%' and city like 'Bang%'

   select a.city,b.avg_temp
     from city_list a,city_data b
    where a.country like 'Ind%'
      and a.city like 'Bang%'
      and a.city = b.city
      and a.country = b.country
   ```

Step 2: Curate/ Prepare data for analysis

```
import pandas as pd

import numpy as np

#Read Local temperature and Global temperature into dataframe

df = pd.read_csv("Bengaluru.csv")
```

```
df_global = pd.read_csv("Gloabl.csv")
```

```
df['avg_temp'].describe()
```

```
count    211.000000
mean      24.853081
std        0.485181
min       23.300000
25%       24.530000
50%       24.880000
75%       25.165000
max       26.610000
Name: avg_temp, dtype: float64
```

```
#Replace nan with average temperature
df['avg_temp'] = df['avg_temp'].fillna(24.05)
```

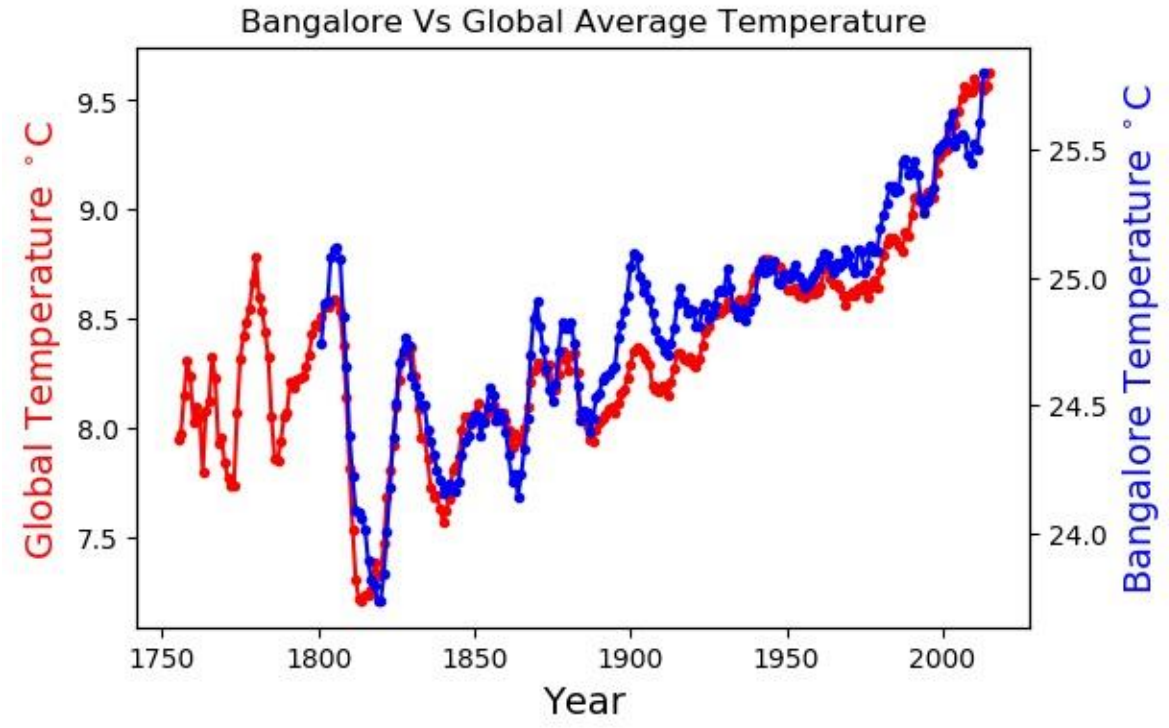
Step 3: Calculate moving averages for smoothening the trend curve

```
#Create column with moving averages
df['Bnglr_Avg_temp'] = df.iloc[:,3].rolling(window=6).mean()
df = df[['year','Bnglr_Avg_temp']]
df_global['Global_Avg_temp'] = df_global ['avg_temp'].rolling(window=6).mean()
df_global = df_global [['year','Global_Avg_temp']]
#merge and create single dataframe
s1 = pd.merge(df_gloabl, df, how='left', on=['year'])
```

Step 4: Plot Line Graph

```
import matplotlib.pyplot as plt
# create figure and axis objects with subplots()
fig,ax = plt.subplots()
# make a plot
ax.plot(s1.year, s1.Global_Avg_temp, color="red", marker=".")
# set x-axis label
ax.set_xlabel("Year",fontsize=14)
# set y-axis label
ax.set_ylabel("Global Temperature $^\circ$C",color="red",fontsize=14)
ax2=ax.twinx()
```

```
# make a plot with different y-axis using second axis object
ax2.plot(s1.year, s1["Bnglr_Avg_temp"],color="blue",marker=".")
ax2.set_ylabel("Bangalore Temperature $^\circ$C",color="blue",fontsize=14)
ax2.set_title("Bangalore Vs Global Average Temperature")
plt.show()
# save the plot as a file
fig.savefig('Weather Trends.jpg',
        format='jpeg',
        dpi=100,
        bbox_inches='tight')
```



Step 5: Calculate correlation coefficient

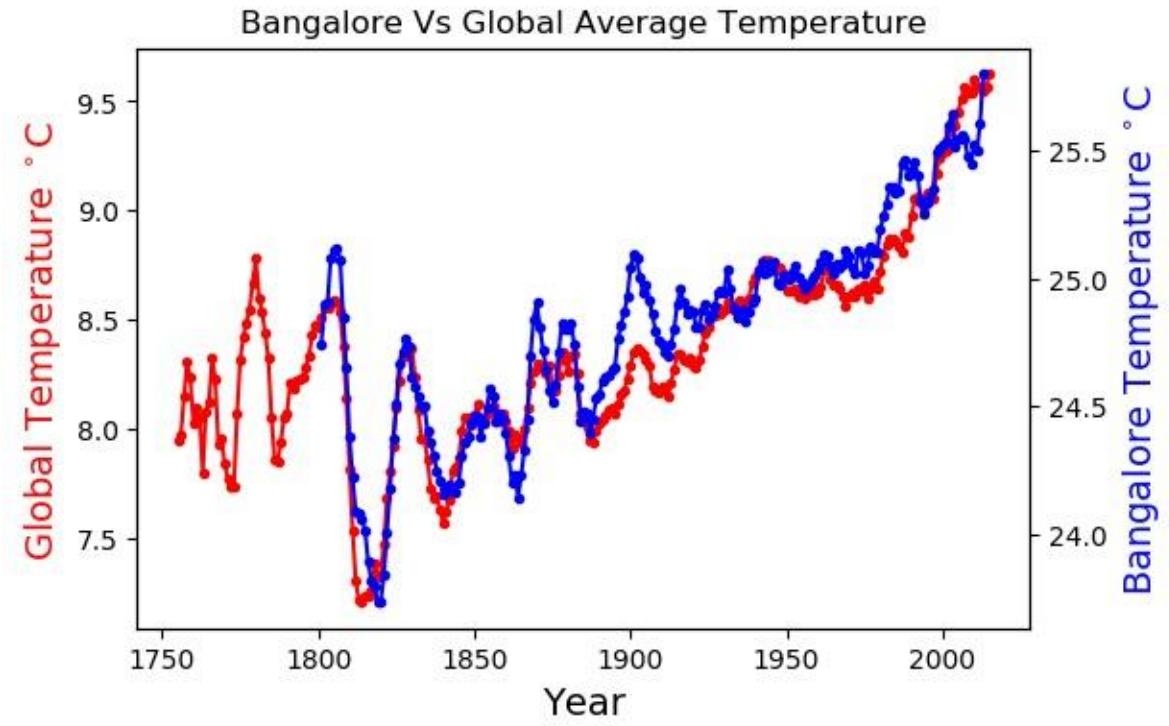
```
import scipy.stats
scipy.stats.linregress(s1_copy['Global_Avg_temp'][(s1['year']>=1801) & (s1['year']<=2013)],
s1_copy['Bnglr_Avg_temp'][(s1['year']>=1801) & (s1['year']<=2013)])
```

```
In [22]: scipy.stats.linregress(s1_copy['Global_Avg_temp'][(s1['year']>=1801) &
(s1['year']<=2013)], s1_copy['Bnglr_Avg_temp'][(s1['year']>=1801) & (s1['year']<=2013)])
Out[22]: LinregressResult(slope=0.8060842178689496, intercept=18.05144828631343,
rvalue=0.9542200752278271, pvalue=1.4399821763349574e-112, stderr=0.01739461873203995)
```

As we can see correlation coefficient is highly positively correlated and hence we can say that global temperature and Bangalore temperature are highly correlated

Step 6: Observations

Let us derive observations by looking into the graph given below:



1. Global average temperature ranges between 7.21 ^{o}C to 9.62 ^{o}C, whereas Bangalore average temperature ranges between 23.73 ^{o}C to 25.8 ^{o}C
2. There is a 2.41 degrees increase in average temperature globally between the year 1755 and 2015 and 2.07 degrees increase in average temperature in my city (Bangalore) between the year 1796 and 2013
3. Bangalore seems to be hotter when compared to average global temperature and it has remained consistent over the period of time
4. From the graph we can speculate that the weather trend in Bangalore follows the global trend with respect to change in temperature
5. We can see that there is a consistent increase in temperature post the year 1850 and it is increasing significantly post the year 1940
6. I have also checked for correlation between the global and Bangalore temperatures and found that there is a very strong positive correlation between the temperature changes and it is also evidently visible in graph plotted above

Plot Considerations:

1. **^{O}C :** Degree Celsius
2. **X - Axis :** Year
3. **Y - Axis LHS:** Global Temperature in ^{O}C
4. **Y - Axis RHS:** Bangalore Temperature in ^{O}C
5. **Legends:** Blue – Bangalore Temperature
   Red – Global Temperature

References:

https://economictimes.indiatimes.com/news/environment/global-warming/how-rise-in-earths-average-global-temperature-is-affecting-our-planet/articleshow/72039042.cms?from=mdr

https://www.thenewsminute.com/article/garden-city-warming-why-climate-change-must-be-election-issue-bengaluru-80176

https://climate.nasa.gov/effects/