

Project 1: Exploring weather trends

Submitted by: Ritu Jain

Analysis of temperature across cities of United States

Step 1: Extracting various data using SQL queries and saving it as csv

SQL query to extract global data

```
SELECT * FROM global_data ; // And save it as Global temperature.csv
```

SQL query to extract all cities data

```
SELECT * FROM city_data ; // and save it as all_cities_temp.csv
```

Codes in python to further extract / filter data

Step 2: Reading csv's using pandas in python

Calling different libraries in python

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

Global temperature:

```
global_temp = pd.read_csv('Global temperature.csv')
```

filtering global temperature for year 1900 to year 2013 to make it comparable with temperatures across all cities during that time frame.

```
global_temp = global_temp.query('year >= 1900 and year <= 2013')
```

All cities temperature:

```
all_temp = pd.read_csv('all_cities_temp.csv')
```

Step 3: Shortlisted cities for analysis

1. Seattle (My city) (West Coast)
2. San Francisco (West Coast)
3. Los Angeles (West Coast)
4. Dallas (Mid)
5. Austin (Mid)
6. New York (East Coast)

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Step 4: Extracting temperature trends of above-mentioned cities (Python)

```
sea_temp = all_temp.query('city == "Seattle" and year >= 1900')[['year','avg_temp']]

sf_temp = all_temp.query('city == "San Francisco" and country == "United States" and year >= 1900')[['year','avg_temp']]

la_temp = all_temp.query('city == "Los Angeles" and country == "United States" and year >= 1900')[['year','avg_temp']]

da_temp = all_temp.query('city == "Dallas" and country == "United States" and year >= 1900')[['year','avg_temp']]

as_temp = all_temp.query('city == "Austin" and country == "United States" and year >= 1900')[['year','avg_temp']]

ny_temp = all_temp.query('city == "New York" and country == "United States" and year >= 1900')[['year','avg_temp']]
```

Step 5: Computing 10 year moving average for global and other cities data and storing them in ten_yr column (Python)

Global

```
global_temp['ten_yr']= global_temp.loc[:, 'avg_temp'].rolling(window = 10).mean()
```

Other cities

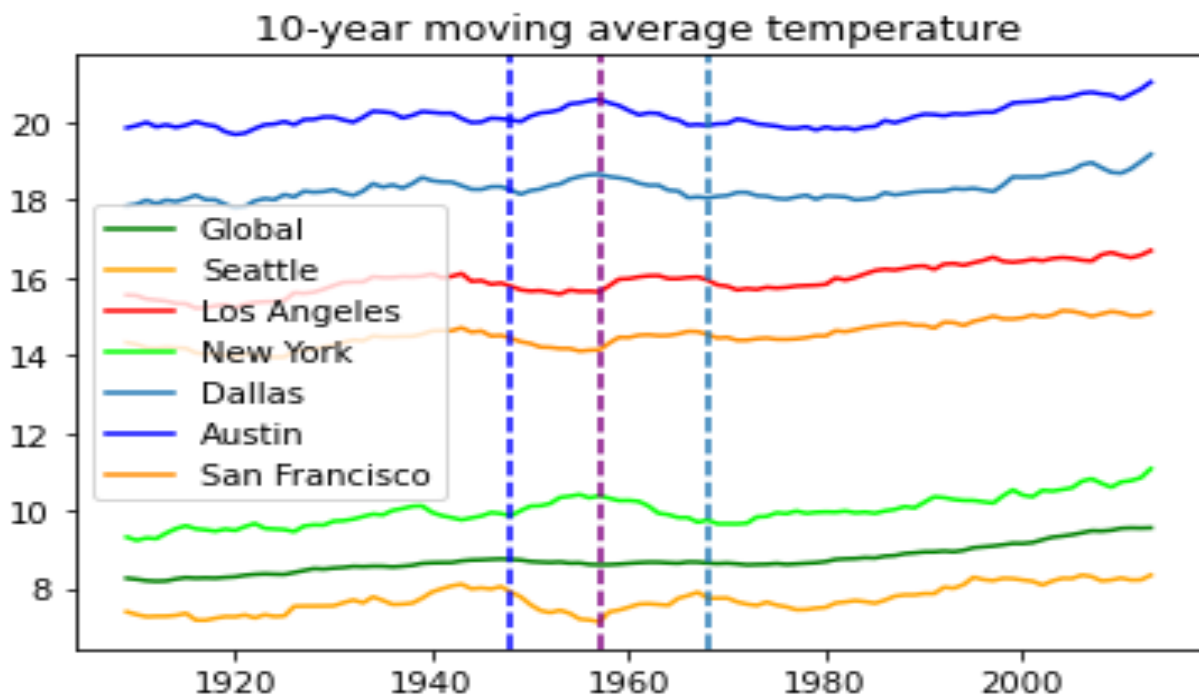
```
sea_temp['ten_yr']= sea_temp.loc[:, 'avg_temp'].rolling(window = 10).mean()
sf_temp['ten_yr']= sf_temp.loc[:, 'avg_temp'].rolling(window = 10).mean()
la_temp['ten_yr']= la_temp.loc[:, 'avg_temp'].rolling(window = 10).mean()
da_temp['ten_yr']= da_temp.loc[:, 'avg_temp'].rolling(window = 10).mean()
as_temp['ten_yr']= as_temp.loc[:, 'avg_temp'].rolling(window = 10).mean()
ny_temp['ten_yr']= ny_temp.loc[:, 'avg_temp'].rolling(window = 10).mean()
```

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Step 6: Plotting the 10-year moving average temperature data for global, and other cities using matplotlib (Python)

```
plt.plot(global_temp.year , global_temp.ten_yr, label = 'Global', color = 'green')
plt.plot(sea_temp.year , sea_temp.ten_yr, label = 'Seattle', color = 'orange')
plt.plot(la_temp.year , la_temp.ten_yr, label = 'Los Angeles', color = 'red')
plt.plot(ny_temp.year , ny_temp.ten_yr, label = 'New York', color = 'lime')
plt.plot(da_temp.year , da_temp.ten_yr, label = 'Dallas')
plt.plot(as_temp.year , as_temp.ten_yr, label = 'Austin' , color = 'blue')
plt.plot(sf_temp.year , sf_temp.ten_yr, label = 'San Francisco' , color = 'darkorange' )
plt.legend(loc = 'best')
plt.title('10-year moving average temperature')
plt.axvline(x= 1948 , ls = '--' , color = 'blue')
plt.axvline(x= 1957 , ls = '--' , color = 'purple')
plt.axvline(x= 1968, ls = '--')
plt.show()
```



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Observations:

1. There seems to be increase in overall (global as well as all selected cities) from year 1900 to year 2013 because of global warming.
2. My city (Seattle) is cooler than global average. The difference is not consistent over time. Thus we cannot estimate the temperature of Seattle on the basis of temperature Globally. Global increase of temperature from 1900 to 2013 is 1.11 degree Celsius and for Seattle is 2 degree Celsius.
3. Globally increase in temperature is uniform and steady, however city wise trend is not uniform with frequent fluctuations, dips and rises.
4. There is a window of 20 years from 1948 – 1968 wherein the west coast cities of United states experienced opposite trend to other states as well as global trends of temperature. During 1948 – 1957 temperatures declined in west coast cities like Seattle, San Francisco and Los Angeles while mid as well as east coast cities experienced increase in temperature. However, the trend got reversed among above section of cities in 1957-1968.