

# Data Analyst Nanodegree Program

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## PROJECT 1 - Exploring Weather Trends

### Outline of steps taken to prepare the data to be visualised in the chart:

1. As I am located in Germany, I used the following SQL query to see which German cities' data are available:

```
SELECT *  
FROM city_list  
WHERE country = 'Germany'
```

Then I used SQL again and the following query to extract the data from the database and download the .CSV file for Hamburg which is the closest German city to where I live:

```
SELECT g.year, g.avg_temp AS Global_Avg , c.avg_temp AS Hamburg_Avg  
FROM global_data g  
JOIN city_data c  
ON g.year = c.year  
WHERE c.city = 'Hamburg';
```

2. Opened the .CSV in excel, switched the columns so Hamburg is first and global second, and then calculated the moving average for 5,10,25,50 and 100 years. I decided to use the 50 years moving average.

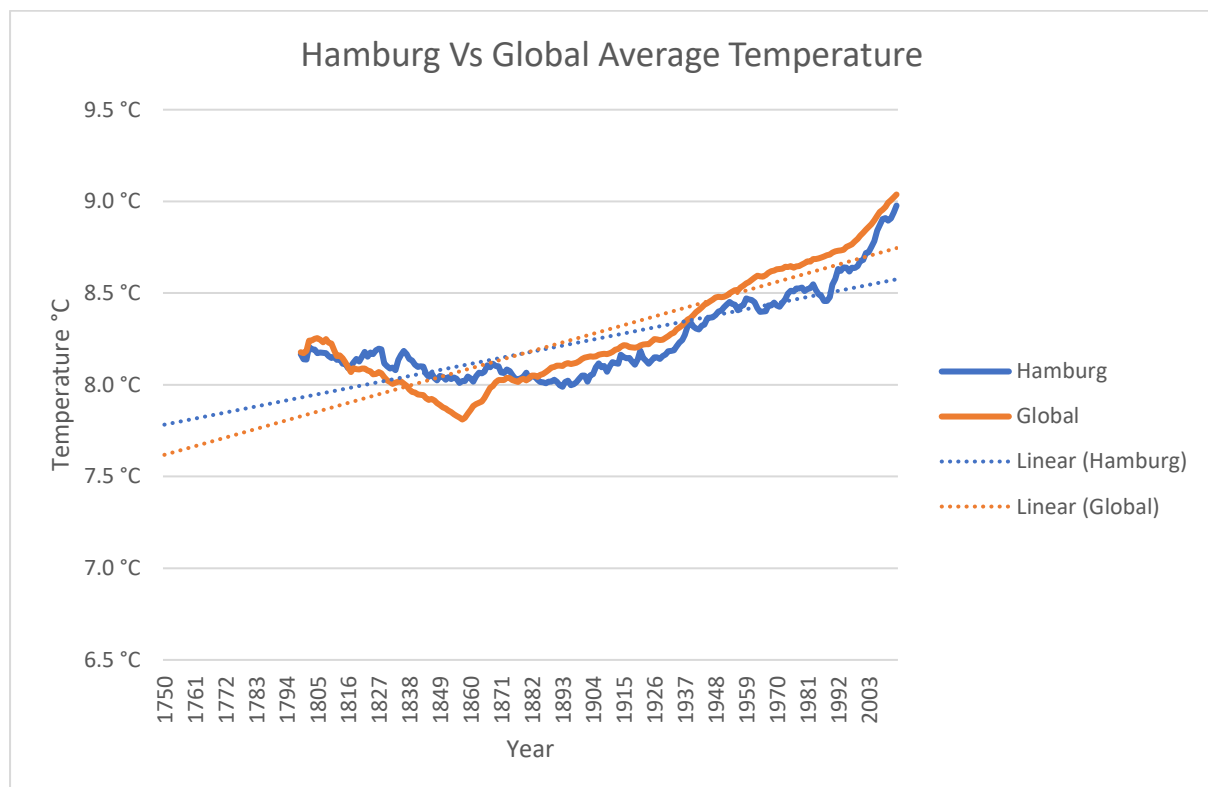
I used the following excel formula in cell C51: =AVERAGE(B2:B51)  
and

the same excel formula in column E51: =AVERAGE(D2:D51)

I dragged till row 265 in both columns, and then selected columns A, C and E and inserted the line chart. Lastly, I styled the chart according to the rubric and

3. Added linear trends to the chart for both Hamburg and global averages to visually compare the difference in increase rates over time. In other words, how faster the temperatures seem to increase globally.

### Line Chart



### Observation/Analysis

By looking at the Hamburg and global average temperatures' trends we can clearly notice an increasing trend in both averages. Temperatures have risen and continue to rise steadily until today with the only difference being the global average temperatures seem to increase faster than Hamburg's.

Looking at the trends separately we notice the following:

**Hamburg:** The average temperatures in Hamburg are overall increasing over the course of the last few hundred years. We can see average temperatures from 7.9°C to 8.9°C with various ups and downs but after year 1900, average temperatures show a long-term increase with some fluctuations and a few spikes and drops until today. The most noticeable is the sudden drop

of almost  $0.1^{\circ}\text{C}$  within a period of 5 years (1983-1988) followed by a rapid increase of roughly  $0.2^{\circ}\text{C}$  within a period of 4 years (1988-1992). The last thing worth mentioning is the final period shown in the graph where the average temperatures in Hamburg have risen about  $0.4^{\circ}\text{C}$  within 15 years (1996-2011).

**Global:** Here the average temperatures have also increased overall but we have a slightly wider range of average temperatures from  $7.8^{\circ}\text{C}$  to  $9^{\circ}\text{C}$ . We notice fewer fluctuations overall and that is normal as the global data set is significantly larger.

There is a clear period of average temperatures' decrease of roughly 50 years (1808-1857) bottoming out and hitting an all-time low of  $7.8^{\circ}\text{C}$  around the year 1857 and a turning point which marks the beginning of a continuous increase in global temperatures. Within this period of increasing average temperatures globally, we notice two trends. The first one lasts roughly 15 years (1857-1872) where the average temperatures have rapidly risen around  $0.2^{\circ}\text{C}$  and the last one 140 years (1873-2013) where the average temperatures have increased with a slower tempo by  $1^{\circ}\text{C}$ .

Comparing the global average temperatures with Hamburg's average temperatures, we can see that they are quite similar. Looking deeper however, we notice 4 different trends in 4 different time periods:

1. **1800-1818:** Starting with a short period where both global and Hamburg average temperatures show a brief increase, global averages maintain its values shortly, while Hamburg averages start dropping right after peaking. Closing this period, global averages finally decrease intersecting with the declining Hamburg averages.
2. **1818-1884:** We notice a steep decline in global averages while Hamburg's averages maintain a steadier track but also in a downward direction with an exemption of an 8 years period where its averages drop  $0.11^{\circ}\text{C}$  closing the gap with the global averages to  $0.07^{\circ}\text{C}$  and rising back up again by  $0.10^{\circ}\text{C}$  widening the gap again to  $0.18^{\circ}\text{C}$
3. **1884-1960:** The average temperatures between Hamburg and the world are during this period generally aligned, with the global averages being slightly higher.
4. **1960-2013:** The global averages are still higher than Hamburg's but we notice that the difference reaches a peak of  $0.25^{\circ}\text{C}$  widening their gap to its maximum before Hamburg's average temperatures bounce back fast almost matching the global averages in the end of the graph.