PROJECT

EXPLORE WEATHER TRENDS

Nanodegree – Data Analysis

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CONTENTS

AIM OF THE PROJECT

To explore the trends of world average temperature over the past many years and compare with the local average temperature trend in cities.

Chosen cities

Hamburg, Germany – Current location

Bangalore, India – Nearest city to my hometown

METHODOLOGY

Data was obtained from the database provided by Udacity, through basic SQL queries. The data was manipulated to obtain a smooth trend using the 10-year moving average method.

SQL QUERY TO EXTRACT THE CITY DATA

```
SELECT year, city, avg_temp
FROM city_data
WHERE (city='Hamburg' or city='Bangalore') AND avg_temp IS NOT NULL;
```

SQL QUERY TO EXTRACT THE GLOBAL DATA

```
SELECT year, avg_temp
FROM global_data
WHERE avg_temp IS NOT NULL;
```

MOVING AVERAGE METHODOLOGY

A moving average (MA) is a widely used indicator in technical analysis that helps smooth out price action by filtering out the "noise" from random short-term price fluctuations (HAYES, 2020). The 10 year moving average in a year in this project is calculated by calculating average of the average temperatures over the last 10 years. Figure 1 shows the calculation method and Figure 2 shows the effect of the moving average method on the average temperature raw data to create a smoother trend curve.

year	city	avg_temp	Moving average
1796	Bangalore	24,49	
1797	Bangalore	25,18	
1798	Bangalore	24,65	
1799	Bangalore	24,81	
1800	Bangalore	24,85	
1801	Bangalore	24,49	
1802	Bangalore	25,44	
1803	Bangalore	25,22	
1804	Bangalore	25,67	
1805	Bangalore	25,01	24,981
1806	Bangalore	37	25,019
1807	Bangalore	24,25	24,926

Figure 1: Moving average methodology

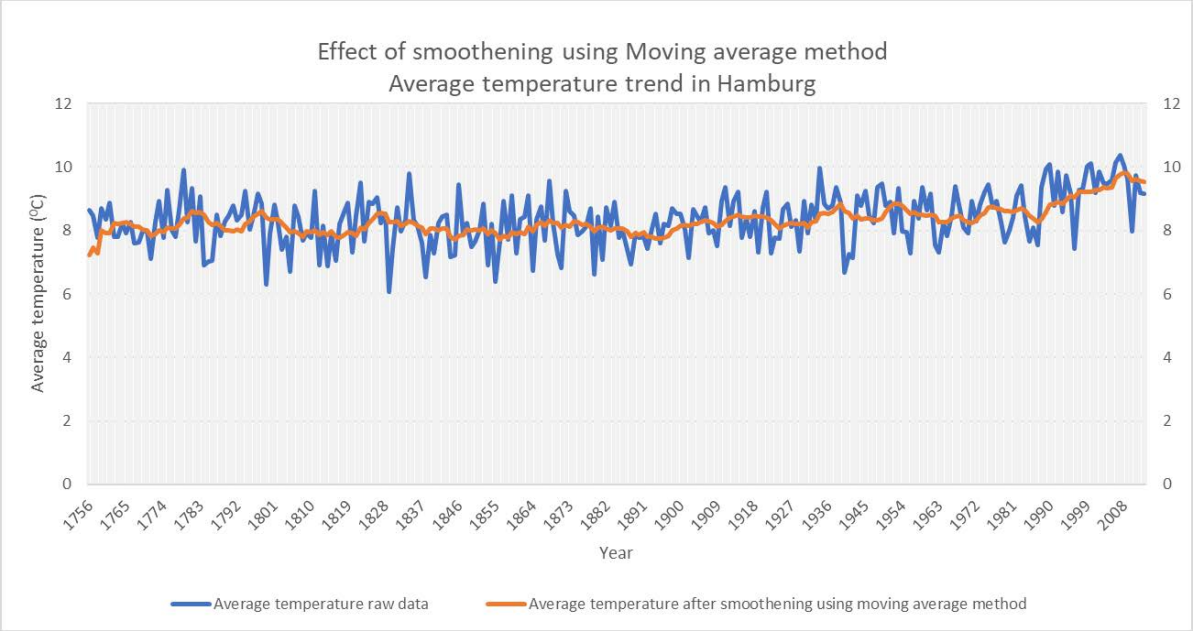
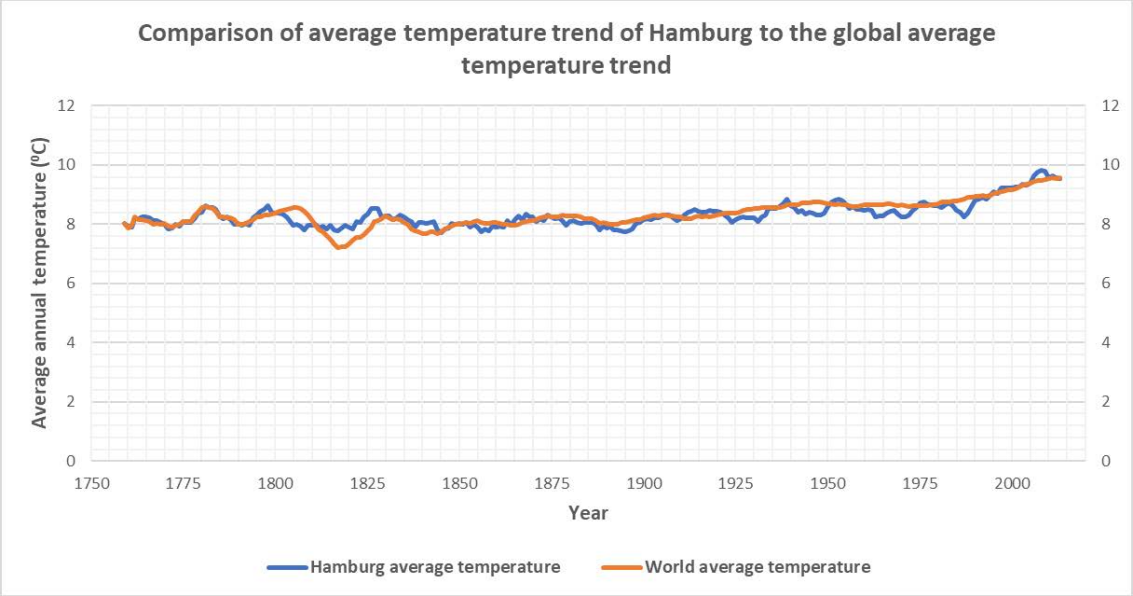


Figure 2 Effect of moving average method on the average temperature data of Hamburg

DATA VISUALISATION

1. HAMBURG TEMPERATURE TREND VS GLOBAL TEMPERATURE TREND



1. BANGALORE TEMPERATURE TREND VS GLOBAL TEMPERATURE TREND

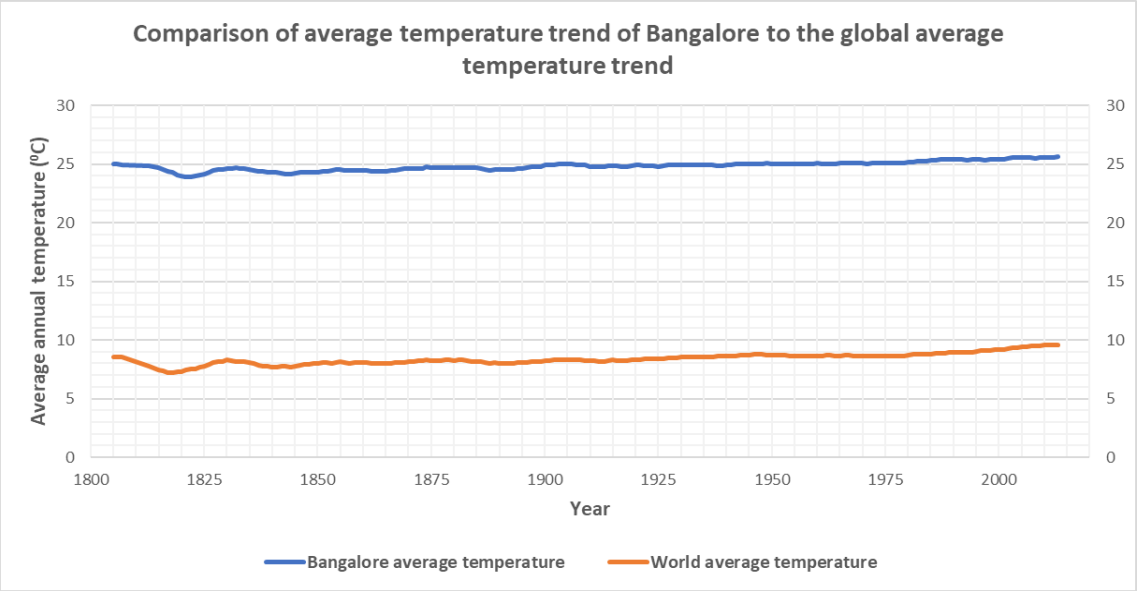


Figure 4 Bangalore and global temperature trends

OBSERVATIONS

1. HAMBURG TEMPERATURE TREND VS GLOBAL TEMPERATURE TREND

- Considering the whole trend, the average annual temperature in Hamburg is more or less very similar to the average global temperature
- Correlation between the two trends was studied and summarized in table below:

Years	Correlation factor
1750-1800	0,90
1800-1850	0,40
1850-1900	0,48
1900-1950	0,35
1950-2013	0,92
whole period	0,66

The correlation between the two trends in general is moderate with a coefficient of 0,66. The correlation was very high during the period 1750 to 1800, which reduced then in the period 1800 to 1950. This indicates that the changes in the temperature in Hamburg are less affected on the global scale or vice versa.

- In the period 1807 to 1819, the global temperature seems to decrease from 8,54 ºC to 7,25 ºC. At the same time the temperature during this period remains quite stable at around 8 ºC.

- In the past 25 years both the trends take a steep to increase from a temperature of 8,93 °C to 9,55 °C

2. BANGALORE TEMPERATURE TREND VS GLOBAL TEMPERATURE TREND

- The average temperatures in Bangalore is much more than the global temperature.

Average Temperature in Bangalore	24,83
Average Temperature in World	8,38

- Correlation between the two trends was studied and summarized in table below:

year	Correlation factor
1800-1850	0,65
1850-1900	0,79
1900-1950	0,66
1950-2013	0,93
whole period	0,93

The correlation between the two trends in general is very high with a coefficient of 0,93. This indicates that the changes in the temperature in Bangalore have good effect on the global scale or vice versa.

- The past 25 years has seen slight increase in both trends, summarized in table below:

	Average temperature in 1990 (°C)	Average temperature in 2010 (°C)
Bangalore	25,38	25,56
World	8,93	9,54

- The gap (difference between the average temperature) between the average temperature of Bangalore and the global temperature decreased slightly from 16,43°C to 16,08 °C comparing year 1805 and 2013.

HAMBURG ANNUAL TEMPERATURE PREDICTION BASED ON GLOBAL TEMPERATURE

In order to find a formula for calculation of hamburg's anuual average temperature based on the global average temperature, the plot is drawn between the two and the best fit is tried to obtain.

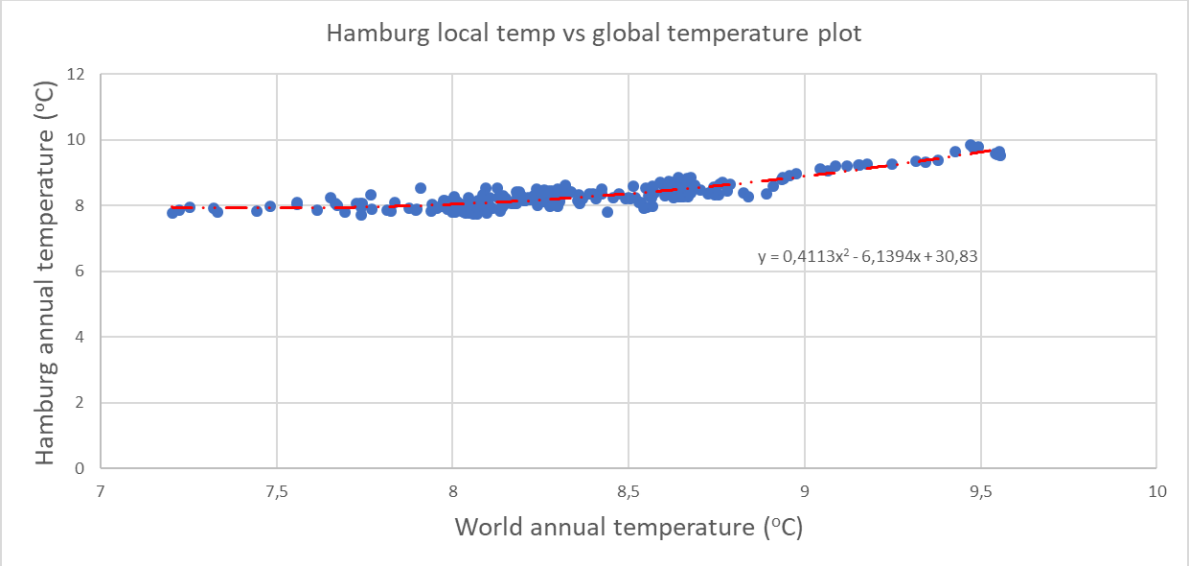


Figure 5 Hamburg temperature vs global temperature scatter plot

The best fit was obtained with polynomial fit with equation:

$$y = 0{,}4113x^2 - 6{,}139x + 30{,}83$$

Where *x* is the global annual average temperature

y is the local annual average temperature in Hamburg.

Using this polynomial equation, we could predict the local temperature from the global temperature.

REFERENCES

HAYES, A. (7. May 2020). *Investopedia*. Von Moving Average: https://www.investopedia.com/terms/m/movingaverage.asp abgerufen