Udacity Data Analysis Degree Project 01: Weather Trends

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Abstract—**Structured Query Language (SQL) was used to download Comma Separated Values (CSV) files of global yearly average temperatures and those from Berlin. The downloaded data was then analyzed using Python. It was found that global temperatures are rising exponentially over recent years and are unlikely to be anomalous. It has been hypothesised that the trend in rising temperature is due to increased carbon dioxide in the atmosphere since this rise in temperature takes place roughly at the same time as the industrial revolution.**

I. Introduction

THE discussion on Global warming has been a topic of fierce debate in politics in recent years. The debate is largely centered around whether or not global temperatures are spiking, what mechanisms drive this change and what is to be done about it. In this publication, global weather data has been analyzed to determine whether or not temperatures are climbing in Europe compared to the global average. The mechanisms behind global warming and what can be done to address it will be outside of the discussion scope.

II. Methods

The data which is used in this analysis was collected from a database using Structures Query Language (SQL) and was subsequently processed using various libraries in Python. (i.e. Pandas, Numpy, Matplotlib, etc.) The scripts contain step by step information about how it was written and can be found at the following url [1]. After a simple visualisation was created, the data was transformed to fit a seven year moving average in order to make the data less noisy.

III. Results and Discussion

It was found that the average global temperature is indeed increasing over time as can be seen in figure 1 where the average global temperature, shown in orange, has high fluctuations in the mid 1700s which slowly stabilizes into an upward trend. The average temperature of Berlin changes far more over relatively short intervals of time. The global temperature tends to have less variation since it is an average over a much larger area that includes multiple landscapes such a forests, mountains, oceans and arctic areas. The average temperature is also driven downward relative to Berlin for the same reason.

When the data was transformed to fit a 7 year moving average, as can be seen by figure 2, trends become more
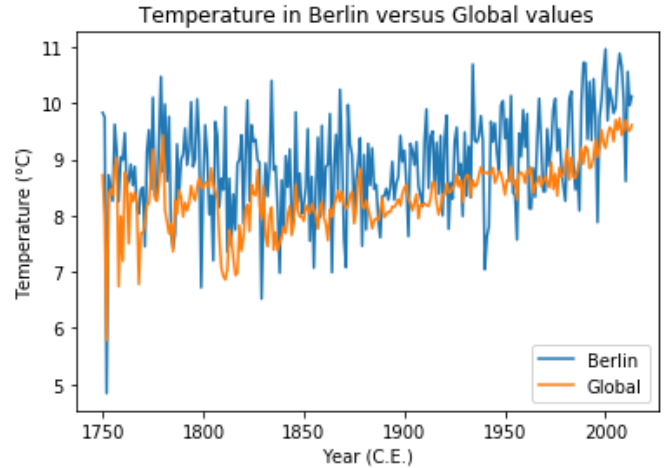

Fig. 1. Simulation results on the AWGN channel. Average throughput k/n vs E_s/N_0.

obvious. This is because taking an average of sections of the data mean that either more varience in a single point is required in order to raise the 7 year average temperature, these conditions can also be satisfied if the temperature raises uniformly over time. The same trend of Berlin having a higher temperature and the presence of large fluctuations in temperatures during the late 1700s is still evident. However, the exponential rise of temperature over time becomes much easier to spot. This is because the temperature is steadily rising instead of having outliers as was often the case before the industrial revolution. This suggests that the forces which are driving the upward in temperatures are compounding themselves. A possible reason for the increase in global temperatures is the increased concentration of carbon dioxide in the atmosphere due to anthropomorphic emissions, but this cannot be concluded from this data alone and more research is required to find a causal link between carbon dioxide concentration and global temperature levels.
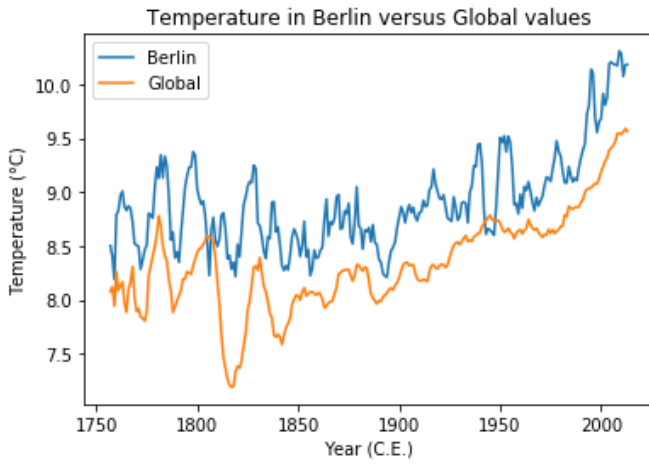
[1]https://github.com/SThornewillvE/Udacity-Project—Exploring-Weather-Trends

Fig. 2. Seven year moving average of the temperature in Berlin (shown in blue) against the corresponding Global values.

IV. CONCLUSION

In conclusion, there is evidence to suggest that the temperature of the globe has been rising over the past century with the global average rising by roughly 1.5C. More research is required in order to determine where this change in temperature comes from and what should be done about it if at all and what this could mean for the world.