

Visual Exploration of Large Earth Surface Temperature Data Sets



03.03.2023

Drashtant Singh Rathod (22111021)
Mannu Kumar Gaddhyan (22111041)
Sudiksha Navik (22111059)
Susovan Patra (22111061)
Aditya Raj (20111005)

Introduction

Climate change is a complex and multifaceted phenomenon that is best understood through visualizations. It can **help us see the patterns and trends** that are shaping our planet. There are many different types of climate change visualizations, each with their own strengths and limitations.

One type of visualization that is commonly used to represent climate change is the **temperature anomaly map**. This type of map shows how much the temperature in a given area deviates from the long-term average, often represented as a color gradient ranging from blues (colder than average) to reds (warmer than average). These maps can **help us see how global temperature patterns are changing over time**, and how different regions of the world are experiencing different levels of warming.

Another type of visualization that is commonly used to represent climate change is the **sea level rise map**. This type of map shows how much sea levels have risen in different parts of the world over time, often using contour lines or shading to indicate different levels of sea level rise. These maps can **help us see how rising sea levels are affecting different coastal regions**, and how vulnerable different communities are to flooding and other impacts of sea level rise.

There can be other types of climate change visualizations including graphs and charts that show trends in **global carbon emissions, changes in precipitation patterns, and shifts in the distribution of plant and animal species** around the world. By using a variety of different visualizations, we can **gain a better understanding of the complex and interrelated factors that are driving climate change**, and how we can work to mitigate its impacts.

Data Description

Title: Climate Change: Earth Surface Temperature Data

DataSet Source:

<https://www.kaggle.com/berkeleyearth/climate-change-earth-surface-temperature-data>

This dataset includes global temperature data from 1750 to 2015, as well as data **on sea level and carbon dioxide concentration**. The temperature data is broken down by country and region, and includes monthly averages as well as annual averages. The sea level data is **based on measurements from tide gauges and satellite observations**, and covers the period from **1880 to 2015**. The carbon dioxide data is based on measurements from the Mauna Loa Observatory in Hawaii, and covers the period from **1958 to 2015**.

In this dataset, there are several files:

Global Land and Ocean-and-Land Temperatures (**GlobalTemperatures.csv**):

- **Date:** starts in 1750 for average land temperature and 1850 for max and min land temperatures and global ocean and land temperatures
- **LandAverageTemperature:** global average land temperature in celsius
- **LandAverageTemperatureUncertainty:** the 95% confidence interval around the average
- **LandMaxTemperature:** global average maximum land temperature in celsius
- **LandMaxTemperatureUncertainty:** the 95% confidence interval around the maximum land temperature
- **LandMinTemperature:** global average minimum land temperature in celsius
- **LandMinTemperatureUncertainty:** the 95% confidence interval around the minimum land temperature
- **LandAndOceanAverageTemperature:** global average land and ocean temperature in celsius

- **LandAndOceanAverageTemperatureUncertainty:** the 95% confidence interval around the global average land and ocean temperature

Other files include:

- Global Average Land Temperature by Country
(**GlobalLandTemperaturesByCountry.csv**)
- Global Average Land Temperature by State
(**GlobalLandTemperaturesByState.csv**)
- Global Land Temperatures By Major City
(**GlobalLandTemperaturesByMajorCity.csv**)
- Global Land Temperatures By City
(**GlobalLandTemperaturesByCity.csv**)

Goals

- With this dataset, we aim to create visualizations that show the **changes in temperature, sea level, and carbon emissions over time.**
- We could create a **line graph** showing the trend in temperature over time with markers indicating key events. It could be a powerful visualization to **help people understand how the Earth's temperature has changed over time** and how it has been influenced by human activities such as the **Industrial Revolution.**
- We could create a **scatter plot** showing the relationship between temperature and carbon emissions over time which could also be **useful to illustrate the link between human activities and climate change.**
- We could also create a **bar chart** comparing sea level rise rates in different regions of the world that could be a powerful visualization to **help people understand the impacts of climate change on coastal communities.**

What will our solution look like?

Our Project will be a standalone visualization system.

Work Division:

We have 5 members in our team.

Member 1: Data Processing

Member 2: Data Processing

Member 3: Visualization changes in temperature

Member 4: Visualization changes in sea level

Member 5: Visualization changes in carbon emissions

Expected Results

So far we have made some progress towards achieving our goals. We have **downloaded the data** from the contest website and **studied the three different types of formats provided in the data**.

After the completion of this project we are expecting to have **an interactive visualization system**. The climate changes are expected to be visualized efficiently. Also, the tracking of changes in temperature, sea level and carbon emissions over time could be done.

References

- Kaggle, Climate Earth Surface Temperature Data, Accessed on 02.03.2023
<https://www.kaggle.com/berkeleyearth/climate-change-earth-surface-temperature-data>
- Berkeley Earth, Data Page, Accessed on 02.03.2023
<https://berkeleyearth.org/data/>