R2 Report

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1 Introduction

This is a brief summary of what we have done for R2 of data visualisation project - "Visualizing Climate Change Dynamics: Insights for Informed Decision-Making"

- Video simulation of rise in global sea level from 1880-2014
- Co2 Emissions for a particular country over the years from 1800-2022
- A Heatmap Times-series of Co2 Emissions over the globe from 1800-2022
- A visualisation of Global surface temperature change comparing with amount of ice in sea from 1978-2019.
- A visualisation of Rainfall and Temperature of India over the years from 1901-2020

2 Video simulation of rise in global sea level from 1880-2014

The datasets we have used for this visualization are in the project folder: `sea_level_data.csv` for visualising the mean sea level changes across the years. For a year we have decided to take the GMSL(Global Mean Sea Level) of the 6th month(June) to reflect the sea level for a year since visualising for every month of years from 1880-2014 would be lengthy and frustrating for the viewer to see. We have decided to take the GMSL of 1880-06-15 to be base zero reference for our visualisation and every other year's GMSL to be taken with reference to GMSL of 1880.

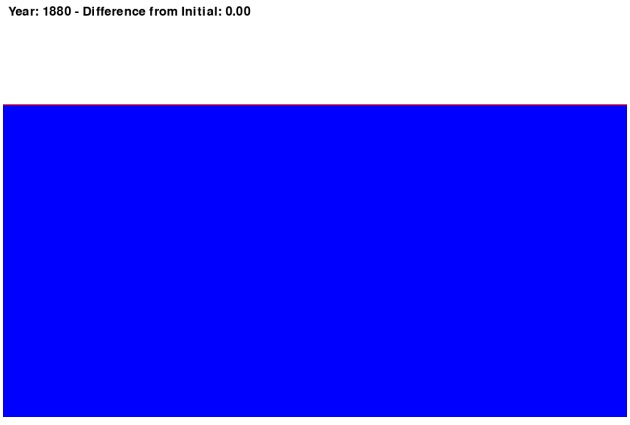

Figure 1: Water level at 1880 - Taken to be reference level zero

Here we have generated frames which is a snapshot of sea level at a particular year. We have combined the frames pertaining to years 1880 all the way to 2014. Our plan involved creating a visually engaging video simulation to illustrate the gradual increase in sea levels over the years using time series visualization. We aim to depict the impact of this rise in a clear and understandable way. By using animation and other visual aids, we want to show how sea levels have been rising steadily over time and how it affects coastal areas and communities.

3 Co2 Emissions for a particular country over the years from 1800-2022

The dataset we have used is in the project folder as `data.csv` for visualising the Co2 emissions for a particular country over the years from 1800-2022.

We have used the values under the columns under 1800-2022 for every country as referenced by its country code(ISO3)in the dataset, and took the rows corresponding to entity KYOTOGHG(AR4GWP100) and category (IPCC2006-PRIMAP) 1.A corresponding to unit CO2 gigagram/a.

For this task we have made a line chart which shows the relationship between year and amount of C02 emissions for a given country on choice. There's an option to display the line graph for a given country with help of a dropdown.

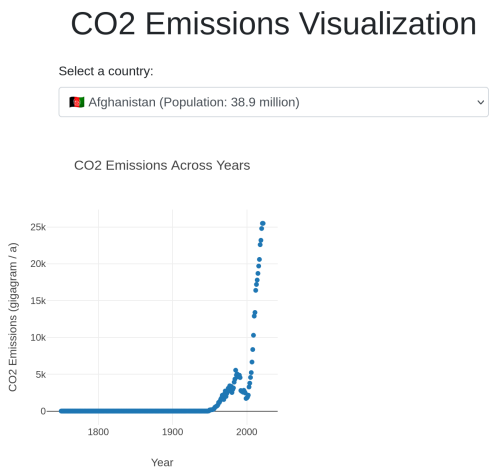

Figure 2: Example line plot

With this plot, users can easily track the increase in CO2 emission levels for a country of their choosing. By observing the rising trend, they can better understand the significant threat that CO2 emissions pose to global warming.

4 A Heatmap Times-series of Co2 Emissions over the globe from 1800-2022

The dataset we have used is in the project folder as `data.csv` for visualising the Heatmap Time-series of Co2 emissions over the globe from 1800-2022.

The dataset we have used here for this visualisation is identically the same used for the previous visualisation with the same columns and rows used for visualisation purpose.

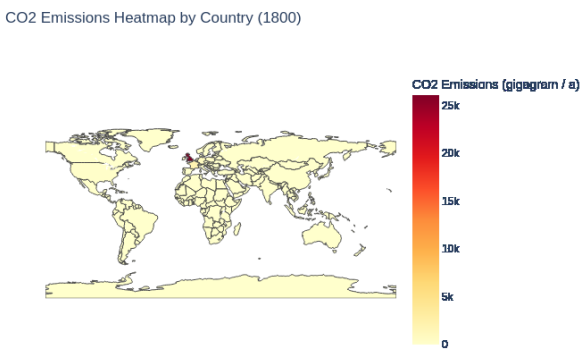

Figure 3: Heatmap snapshot of C02 emissions over the globe for the year 1800 - Color

Using this visualisation, one can compare the co2 emissions country wise under the same visualisation. This heatmap makes it easier to make comparisons across different countries and their rates of C02 emissions over the years which was not possible in the previous visualisation of the line-chart.

5 A visualisation of Global surface temperature change comparing with amount of ice in sea from 1978-2019.

The datasets we have used for this visualisation is in the project folder-`seaice.csv` and `GlobalTemperature.csv`. The attributes we have used from the `seaice.csv` are Year and Extent. We have calculated the mean Extent for a year and mapped it to the corresponding year. Similarly, the attributes we have used from `GlobalTemperature.csv` are dt and LandAverageTemperature. From these two columns, we have extracted the year and calculated the mean LandAverageTemperature and mapped it to the corresponding year.

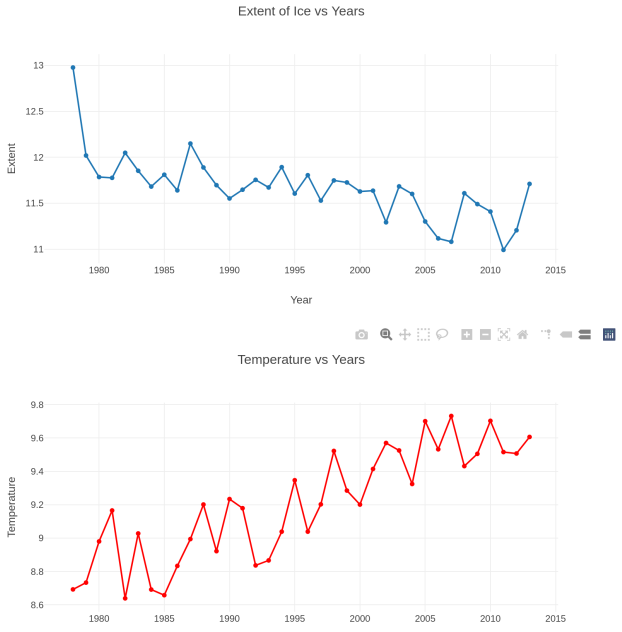

Figure 4: The Plots showing extent of Ice vs Year and Average Surface temperature vs Year

With help of this visualisation, we can see how over the years the amount of ice in the seas have dwindled down and this can be attributed by the overall rise of average surface temperature of earth which is at a positive rate of growth. These line-charts can advocate the effect of climate change on the increase of average surface temperature of earth which in turn leads to the melting of ice glaciers in the seas leading to a rise of sea levels leading to flooding and submerging of coastal areas near the sea.

6 A visualization of Rainfall and Temperature of India over the years from 1901-2020

The datasets we have used for this visualization are in the project folder: `TEMP_ANNUAL_SEASONAL_MEAN.csv` and `RF_AI_1901-2021.CSV`. We have used all the attributes and rows of both datasets for this visualization.

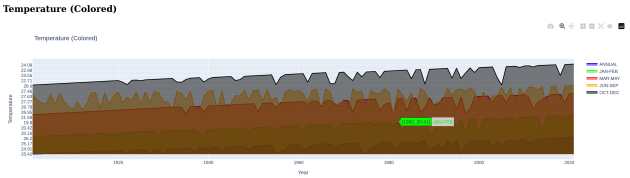

Figure 5: Plot(Color) showing temperature of India averaged for every consecutive three months and annually over the years

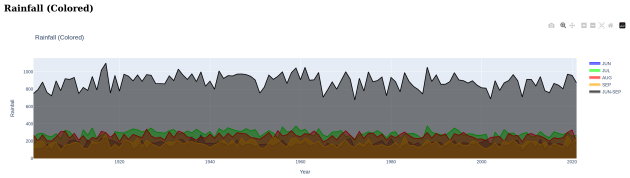

Figure 6: Plot(Color) showing rainfall of India averaged for every consecutive three months and annually over the years

The plots allow interactive exploration, enabling users to hover over data points to view the temperature and rainfall for a particular three-month period (e.g., January-March) and to see the annual average temperature and rainfall for a specific year. This interactivity facilitates the observation of how rainfall and temperature vary across months within a year and facilitates comparisons between different years. Moreover, users can compare temperature and rainfall trends across the entire time span, offering insights into long-term climatic patterns particular to India.