Problem statement:

Global temperature rise is one of the most pressing issues of our time. Since the Industrial Revolution, the release of greenhouse gases from human activity has dramatically impacted the Earth's climate system. These changes are reflected in rising global temperatures, extreme weather events, and long-term environmental shifts. This project aims to visualize the patterns, deviations, and regional differences in global temperature change from 1961 to 2019 in a compelling and interactive way..

Target audience

1. **Primary Audience**: Environmental researchers, policy makers, and climate-conscious individuals..
2. **Tasks**: Identify global and regional trends in temperature change.

 Compare seasonal temperature deviations over time.

 Explore correlations between deviation and average temperature.

1. **Benefit**: Our visualization enables stakeholders to make sense of decades of climate data, identify hotspots, and support discussions on environmental policy, sustainability, and education.

Related work

1. NASA Earth Observatory – Global Temperatures

<https://earthobservatory.nasa.gov/world-of-change/global-temperatures>

Inspiration: NASA provides detailed visualizations of global temperature changes, covering trends since 1880 and explaining the scientific context.

Difference: Our project focuses on the period from 1961 to 2019 and further explores seasonal differences, variation trends, and country-level comparisons to enable more fine-grained analysis.

1. Our World in Data – Climate Change

<https://ourworldindata.org/climate-change>

Inspiration: This project aggregates a wide range of climate-related metrics, including greenhouse gas emissions, temperatures, and energy sources, using interactive charts to show global trends.

Difference: Our project emphasizes storytelling and interpretation. We accompany each visualization with narrative commentary, highlighting variability, seasonal change, and local impacts in an accessible, engaging format.

1. UCAR Center for Science Education – Future Climate Predictions

<https://scied.ucar.edu/learning-zone/climate-change-impacts/predictions-future-global-climate>

Inspiration: This resource explains how scientists predict future climate trends and emphasizes the long-term consequences of current climate change.

Difference: While our project is based on historical data, it is designed to reveal trends and variability that inform future projections. Through interactive visualizations, we aim to enhance public understanding and engagement with climate science.

Data source

1. **Primary Dataset**:  
   *Environment\_Temperature\_change\_E\_All\_Data\_NOFLAG.csv* – This dataset is sourced from the **Food and Agriculture Organization of the United Nations (FAO)**. It contains annual temperature change data by country, spanning from **1961 to 2019**, measured as deviation from a baseline period.
2. **Data Type & Format**:  
   The dataset is in **CSV format** and is **unstructured**. It includes fields such as country name, year, average temperature change (°C), standard deviation (°C)
3. **Strengths**:

Covers a long temporal range (59 years)

Offers country-level granularity

Globally recognized and widely used source (FAO)

1. **Limitations**:

Missing or incomplete data for some countries or years

1. **Data Cleaning & Wrangling**:

Removed null values

Converted wide-format table to long-format (year-wise) for time series visualization

1. **Backup Plan**: If this dataset becomes unavailable or is found incomplete, we will switch to:

**NOAA Global Historical Climatology Network (GHCN)**

Simulated seasonal temperature data with controlled noise for structural testing

1. **Exploratory Analysis Conducted**:

**Global average temperature change over time**

**Global temperature change trend (1961-2019)**

**Global average standard deviation change over time**

**Unusual years with extreme temperature deviation**

**Temperature change over time by country**

**Seasonal temperature change**

**Seasonal temperature boxplots**

**Seasonal deviation change**

**Seasonal deviation boxplots**

**Average temperature bar chart**

Team organization

 **Team Communication**: We use GitHub for version control, when we have some ideas, we discuss on whatsapp or offline.

 **Roles**:

Arystan Kamalov : Fullstack Developer

*Viktor Korotkov*: Solutions Designer

*Shitao Zhao*: Data Analyst