An Analysis on Annual Surface Temperature Change

I. Introduction

In this section, describe the significance of your analysis and what you expect to observe. You can use the following structure:

1. **Background**: Introduce the global issue of climate change and its significance.
    - Briefly mention how temperature changes are one of the primary indicators of climate change.
2. **Objective**: Outline the objective of the analysis, which is to examine annual surface temperature changes across countries from 1967 to 2023.
    - "This analysis aims to visualize the annual temperature changes over the last few decades and identify regions experiencing the most significant changes."
3. **Importance**: Explain why this analysis is important.
    - "Understanding the patterns and trends of temperature change helps us gauge the extent of global warming, providing insights into future climate impacts and the necessary mitigation ef

II. Methodology

A. The Dataset

Here, provide an overview of the dataset:

Source: Mention where the dataset was obtained from (if applicable).

Countries Covered: "The dataset includes temperature records for X number of countries over a span of 56 years, from 1967 to 2023."

Variables: Describe the temperature-related columns and any other relevant information, such as the year range and country-specific data.

B. Pre-processing

In this section, describe the data cleaning process:

Missing Data: Mention whether there were missing values and how you handled them. Example: "Missing values were addressed by filling the gaps using the mean temperature for each year. This ensured a more accurate and complete dataset for analysis."

Data Transformation: Briefly explain any transformations (e.g., creating columns for average temperature changes).

C. Analysis

This section describes the analysis performed in Part I through III of the assignment. You can break it down into subsections for clarity:

(i) Visualizing Mean Temperature Change for Each Country (2013-2023):

Provide a brief explanation of why you chose a bar plot for this analysis.

"We used a bar plot to display the mean temperature change for each country over the last decade (2013-2023) to observe differences across countries."

(ii) Average Global Temperature Change (1967-2023):

Explain how you computed the average temperature changes for each year and why a line plot was suitable for this data.

"A line plot was chosen to track the global temperature change over time as it provides a clear visualization of trends."

(iii) Top 5 Countries with Highest Mean Temperature Change:

Describe how you identified the top 5 countries with the highest temperature changes and plotted their temperature changes over time.

Include relevant code snippets, such as:

python

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```
# Example of how mean temperature change was calculated for each country

recent_years = [f'Temp_{year}' for year in range(2013, 2023+1)]

df_cleaned['Mean Temp (Last Decade)'] = df_cleaned[recent_years].mean(axis=1)


# Example of how top 5 countries were identified

top_5_countries = df_cleaned.nlargest(5, 'Mean Temp. Change')
```

III. Results and Discussion

Present the results of your analysis in this section. Organize it into logical subsections, such as:

A. Global Temperature Trends

Describe the general trends in global temperature changes from 1967 to 2023.

Discuss any observed patterns such as a general upward trend, periods of rapid increase, and any possible scientific explanations (e.g., industrialization, CO_2 emissions).

B. Country-Specific Temperature Changes

Discuss the results from the visualization of temperature changes for each country over the last decade (2013-2023).

Point out countries with significant increases and possible reasons for this (e.g., industrialization, deforestation).

C. Top 5 Countries with the Highest Temperature Change

Present and discuss the trends observed for the top 5 countries. Describe the patterns over time for these countries and any environmental or geographical factors contributing to the changes.

D. Observations

Discuss the scientific implications of the data. For example:

"The consistent rise in global temperatures correlates with increased greenhouse gas emissions, while countries with the steepest increases are often those with significant deforestation or industrial growth."

IV. Conclusion

Summarize the key findings of the analysis. Discuss the broader implications of these findings on climate science and policy-making.

Summary of Findings:

"Our analysis highlights a consistent rise in global temperatures over the past 56 years, with certain countries experiencing significantly higher increases due to geographical and industrial factors."

Future Work: Mention possible extensions of the analysis:

"Future work could focus on analyzing the impact of these temperature changes on specific ecosystems or studying correlations with socio-economic factors such as industrial output and population