Data Analysis Report: Indian Government Open Data - Temperature Trends

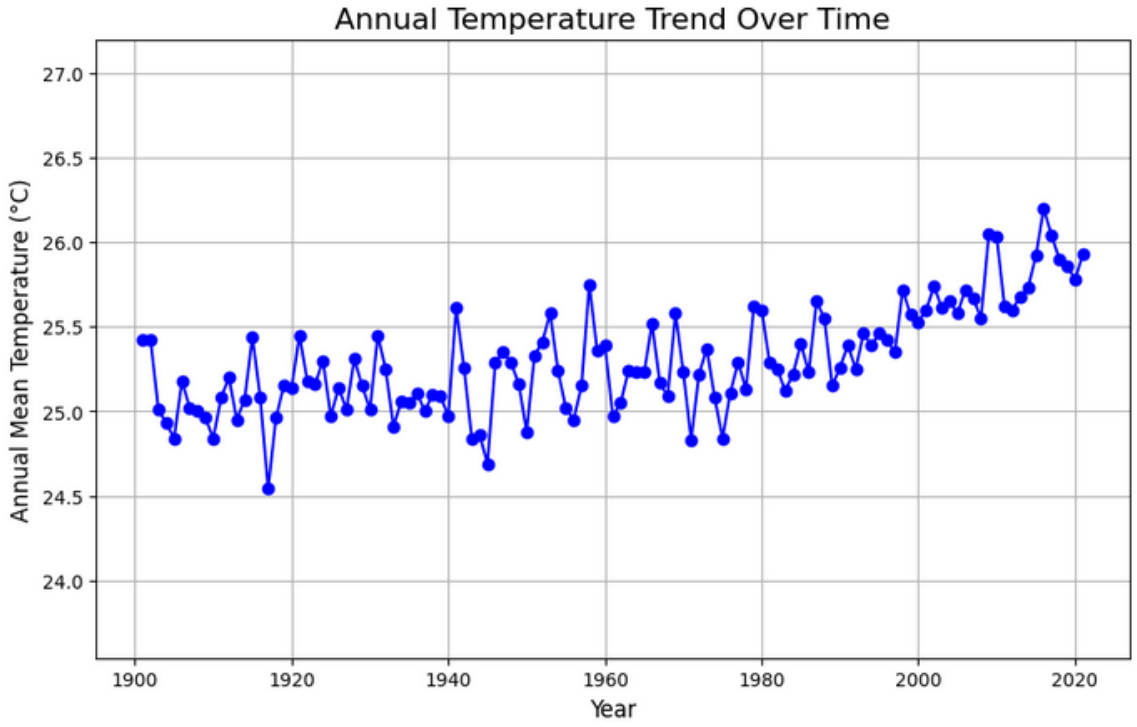
Overview:

This analysis focuses on the temperature trends of India, utilizing data from the Indian Government Open Data platform. The dataset comprises annual and seasonal mean temperatures from 1901 to 2020, including the following columns:

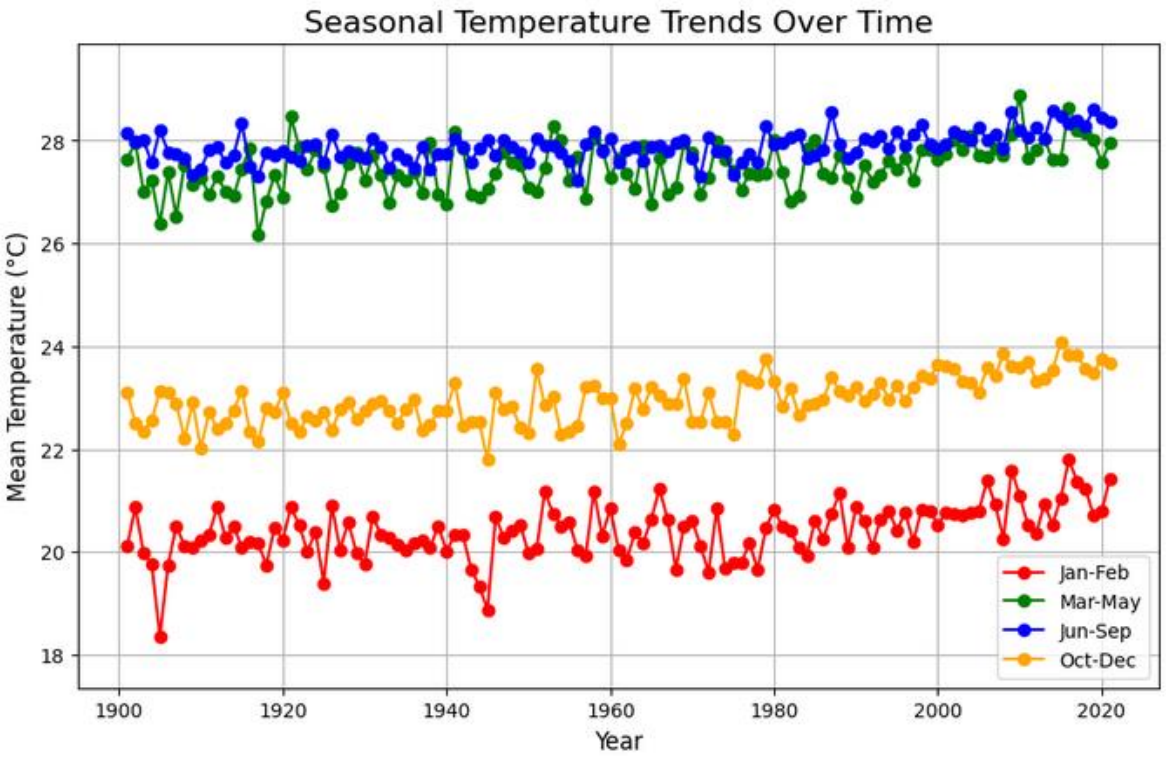
- **YEAR**: The year of observation.
- **ANNUAL**: The annual mean temperature (in °C).
- **JAN-FEB**: Mean temperature during January-February.
- **MAR-MAY**: Mean temperature during March-May.
- **JUN-SEP**: Mean temperature during June-September.
- **OCT-DEC**: Mean temperature during October-December.

Data Visualizations:

1. **Annual Temperature Trend Over Time (1901-2020)**: The graph shows fluctuations in annual mean temperatures, with an overall upward trend. Between 1901 and the 1970s, the temperatures hovered around 24.5°C to 25.5°C. Post-1970, a gradual increase is noticeable, with temperatures crossing 26°C by 2000. The highest temperature values appear after the 2000s, suggesting a warming trend in India.



2. **Seasonal Temperature Trends Over Time**: This graph highlights the temperature variations for four key seasons:
    - **Jan-Feb** (red): There is a slight rise in mean temperatures over time, but it remains below 22°C.
    - **Mar-May** (green): Relatively stable temperatures, fluctuating around 27°C-28°C.
    - **Jun-Sep** (blue): The hottest period, averaging around 28°C, with minor fluctuations over time.
    - **Oct-Dec** (yellow): Temperatures remain between 22°C-24°C, with a slight increase post-2000.



Key Findings:

1. **Warming Trend**:
    - The overall rise in annual temperatures suggests a warming climate in India, especially from the late 20th century onward.
    - The **annual mean temperature** increased by nearly 1°C over the past century, indicating a significant shift in India's climate.
2. **Seasonal Variability**:
    - **June-September** continues to be the warmest period, with consistent temperatures above 28°C.
    - **January-February** is the coldest season, but even this period has experienced a gradual increase, from below 20°C to closer to 22°C in recent years.
    - The moderate seasons, **March-May** and **October-December**, also show small yet noticeable increases in temperature, indicating year-round warming.

Conclusion:

The analysis of India's annual and seasonal temperature trends from 1901 to 2020 reveals a significant and concerning upward trend in temperatures over time. The **annual mean temperature** has risen by nearly 1°C, with noticeable acceleration post-1970, pointing to a clear warming trend in India's climate. This is especially evident in the last two decades, where temperatures consistently exceed historical averages.

Breaking the data down seasonally:

- The **June-September** period remains the hottest, averaging above 28°C, with only minor fluctuations over the past century.
- **January-February** has seen a gradual increase in temperatures, moving from below 20°C at the beginning of the century to closer to 22°C in recent years.
- **March-May** and **October-December** also reflect minor but significant temperature increases, indicating a year-round warming pattern.

These findings are consistent with global trends in climate change, which could lead to more frequent heatwaves, altered weather patterns, and ecological disruptions in India. The warming climate is particularly concerning for India's agricultural economy, which is highly dependent on stable weather patterns. Rising temperatures during the winter and summer months could further impact water resources, public health, and food security.