Q1.Here are two important questions regarding the relationship between the dependent and independent variables:

* How does the actual temperature (actual\_mean\_temp , actual\_min\_temp, actual\_max\_temp) correlate with the average temperature (average\_min\_temp, average\_max\_temp)? Is there a strong positive correlation between the actual and average temperatures, indicating consistency in weather patterns over time?
* Is there a relationship between record weather events (record\_min\_temp, record\_max\_temp, record\_min\_temp\_year, record\_max\_temp\_year, record\_precipitation) and the actual weather conditions (actual\_mean\_temp, actual\_min\_temp, actual\_max\_temp, actual\_precipitation)? For example, do extreme record temperatures or precipitation events coincide with higher or lower actual temperatures and precipitation on the same days or within the same periods?

Answer why this question(s) is/are important to you?

* Weather Prediction and Forecasting: By examining the correlation between actual and average temperatures, meteorologists can gain insights into the consistency of weather patterns over time. A strong positive correlation between these variables suggests that average temperatures can be a reliable indicator of actual temperatures, which is crucial for accurate weather prediction and forecasting.
* Climate Change Studies: Investigating the relationship between record weather events and actual weather conditions helps in understanding the impact of extreme weather events on the climate. If extreme record temperatures or precipitation events coincide with higher or lower actual temperatures and precipitation, it may indicate shifts or anomalies in weather patterns that could be attributed to climate change.
* Resource Management: Understanding how actual temperatures correlate with average temperatures can be beneficial for resource management in various sectors such as agriculture, energy, and water management. It helps stakeholders make informed decisions regarding crop planting, energy consumption, and water usage based on expected weather conditions.
* Risk Assessment and Disaster Preparedness: Identifying relationships between record weather events and actual weather conditions is essential for risk assessment and disaster preparedness. If extreme record temperatures or precipitation events coincide with adverse actual weather conditions, it may increase the risk of weather-related disasters such as heatwaves, floods, or droughts, prompting the need for proactive measures to mitigate risks and enhance preparedness.
* Research and Policy Development: Research on the relationship between actual and average temperatures, as well as record weather events and actual weather conditions, contributes to scientific knowledge and informs policy development related to climate resilience, adaptation strategies, and environmental protection.
* Overall, addressing these questions enhances our understanding of weather variability, climate dynamics, and their implications for various sectors and society as a whole, ultimately supporting informed decision-making and resilience in the face of changing environmental conditions.

3. Describe your data.

Based on the provided variables, the data appears to be related to weather conditions, particularly temperature and precipitation. Here's a description of the data:

Dependent (Response) Variables:

1. actual\_mean\_temp: The actual mean temperature observed during a specific period.(Integer)

2. actual\_min\_temp: The actual minimum temperature observed during a specific period. (Integer)

3. actual\_max\_temp: The actual maximum temperature observed during a specific period. (Integer)

4. actual\_precipitation: The actual amount of precipitation (e.g., rainfall, snowfall) observed during a specific period. (Numeric data)

5. record\_min\_temp: The record minimum temperature observed historically. (Integer)

6. record\_max\_temp: The record maximum temperature observed historically. (Integer)

7. record\_min\_temp\_year: The year in which the record minimum temperature was observed. (Integer)

8. record\_max\_temp\_year: The year in which the record maximum temperature was observed. (Integer)

9. record\_precipitation: The record amount of precipitation observed historically.(Numeric data)

Independent (Predictor) Variables:

1. average\_min\_temp: The average minimum temperature observed over a period (e.g., monthly, yearly). (Integer)

2. average\_max\_temp: The average maximum temperature observed over a period (e.g., monthly, yearly). (Integer)

3. average\_precipitation: The average amount of precipitation (e.g., rainfall, snowfall) observed over a period. (Numeric data)

Overall, the dataset includes variables related to both actual weather conditions observed during specific periods and historical record weather events. The independent variables represent average weather conditions observed over longer periods, which can be used to compare and analyze trends and deviations from historical records.

Result from analysis:

**From Q1:**

Overall, the correlation matrix indicates strong positive correlations between actual weather conditions variables (actual\_mean\_temp, actual\_min\_temp, actual\_max\_temp) and average weather conditions variables (average\_min\_temp, average\_max\_temp). This suggests consistency in temperature patterns over time, with actual temperatures showing strong positive associations with average temperatures.

The correlation coefficients indicate strong positive linear relationships between actual temperature measurements and average temperature measurements, suggesting consistency in temperature patterns over time and across different measurement methods (actual vs. average).

**From Q2:**

The correlation matrix provides insights into the relationships between different weather variables, including actual temperatures, record temperatures, and precipitation. It helps understand the interplay between these variables and their potential impact on weather patterns and trends.