Factors That Effect Climate Change

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This paper conducts an in-depth exploratory data analysis (EDA) and statistical inferences focusing on climate change factors, specifically the variables Aerosols, CH4, MEI, CO2, and Temp. The primary statistical inquiry guiding this analysis is to discern the factors influencing temperature. Through a careful examination of these variables, the study aims to uncover patterns and relationships that contribute to a more nuanced understanding of the complex dynamics within the climate system.

# EDA Outcome

The exploratory data analysis (EDA) encompassed various essential steps, incorporating outlier detection, histogram analysis, calculation of descriptive statistics, probability mass function (PMF), cumulative distribution function (CDF), analytical distribution, scatter plots, hypothesis testing, and regression analysis. Utilizing the Z-score test for outliers, we identified thirteen extreme values, prompting their exclusion from the dataset. Histograms were crafted for each variable, offering valuable insights into data distribution, while descriptive statistics, encompassing mean, mode, standard deviation, and skewness, provided a comprehensive overview. Probability Mass Function (PMF) and Cumulative Distribution Function (CDF) plots were generated specifically for CO2 concentration, aiding in comprehending the distribution and cumulative probability of CO2 values. An analytical distribution, specifically a normal distribution, was fitted to the temperature variable, enabling a comparison between observed data distribution and theoretical expectations. Additionally, scatter plots were generated to visually assess relationships between temperature and other variables (CO2, MEI, Aerosols, CH4), facilitating the identification of correlations and potential patterns in the data. To evaluate the significance of the observed correlation between CO2 and temperature, a permutation test was conducted, revealing a highly significant correlation that supports the hypothesis linking changes in CO2 concentration with temperature variations. Furthermore, a multiple linear regression analysis employing CO2, Aerosols, and MEI as explanatory variables provided insights into the intricate relationship between these factors and temperature.

Missed Opportunities and Challenges

While I explored various statistical methods in my analysis, there are clear areas for improvement and some challenges. One key improvement could be adding more variables for a deeper analysis. Also, I'm taking a closer look at the assumptions I made during the analysis to make sure they hold up. Additionally, there might be interesting connections between things that I haven't fully explored yet. So, there's room for more investigation. Bringing in more factors and carefully examining those assumptions could enhance our understanding of climate change factors.

Challenges faced during the analysis included the need for domain-specific knowledge to interpret results and the consideration of the broader context when deciding to handle outliers. The statistical significance observed in the permutation test highlights the robustness of the findings but emphasizes the importance of cautious interpretation.

Conclusion

In conclusion, this project has provided a comprehensive exploration of climate change factors through an extensive analysis of variables such as Aerosols, CH4, MEI, CO2, and Temp. The application of diverse statistical methods, including outlier detection, histogram analysis, and regression modeling, has offered valuable insights into the complex relationships within the dataset. While the analysis uncovered significant correlations, it also highlighted potential opportunities for improvement, such as the inclusion of additional variables and a more nuanced examination of assumptions. These considerations underscore the dynamic nature of scientific inquiry and the continuous refinement required in the pursuit of a deeper understanding of climate change dynamics. Moving forward, incorporating these insights and addressing identified areas for enhancement will contribute to a more insightful analysis.