0. Descriptive Statistics:

* Distribution of solar farms by county and state
* Average solar farm size (p\_area) and capacity (p\_cap\_ac, p\_cap\_dc)

1. Geographic Impact on Solar Farm Efficiency

* Spatial Analysis: Utilize GIS techniques to correlate the geographic location (latitude, longitude) of solar farms with efficiency metrics (p\_cap\_ac/dc).
* Environmental Correlation: Assess how local environmental factors, such as county-level climate data (if available), may influence the performance of solar farms.
* State and County Trends: Evaluate if there are state or county-specific trends that could be influencing solar farm efficiency, such as local policies, average sunlight hours, or temperature variations.

2. Technological and Design Factors Affecting Efficiency

* Panel Orientation Analysis: Investigate the relationship between panel orientation variables (p\_axis, p\_azimuth, p\_tilt) and energy output, to determine optimal design configurations.
* Technology Type Evaluation: Compare efficiency across different primary and secondary technology types (p\_tech\_sec) to identify which technologies perform best under various local conditions.
* Battery Storage Impact: Analyze the role of battery storage (p\_battery) in maintaining and enhancing energy efficiency, particularly in terms of energy reliability during non-sunlight hours or peak demand times.

3. Temporal Trends and Their Implications for Future Solar Farm Development

* Development Over Time: Examine how the size (p\_area) and capacity (p\_cap\_ac, p\_cap\_dc) of solar farms have changed over the years and what this might suggest about industry trends.
* Efficiency Improvements: Use the year of installation (p\_year) to assess how new technologies and designs have contributed to improvements in efficiency over time.
* Policy Influence: Consider how regional power regulations (p\_pwr\_reg) and the timing of implementation (linked to p\_img\_date) have affected the growth and efficiency of solar farms.

Super bowl url: <https://www.cbsnews.com/news/super-bowl-2024-to-be-powered-by-nevada-desert-solar-farm/?ftag=CNM-00-10aac3a>

* Solar Farm Area Trends (Figure 7 left): Initiated with high areas in 1986, experienced a decrease until 2006, followed by a consistent rise with a slight dip in 2016.
* Capacity Growth (Figure 7 right): Both DC and AC capacities show a continuous upward trend from 1986, with significant fluctuations in 2016 and 2018, indicating technological progress and occasional market floats.
* Efficiency Ratio Trends: A regression algorithm is trained using historical data and factors including the *year, the GDP growth(%) & annual changes, temperature*. The visualization shows a steady growth in the next 10 years with a notable increase predicted in 2026.
* Efficiency Increase Rate: Marks a peak in 2007, attributed to rising demand catalyzing industry advancements, signifying demand-driven progress in solar technology.
* Limitations: Excludes critical environmental and geographical impacts like weather and sea levels, which significantly affect solar energy potential and farm performance. (空间不够可以删掉limitations)