The Evolution of Solar Panel Adoption in California: 1998-2019

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1. *Introduction*

Research Question: Which parts of California has experienced the greatest residential solar panel adoption rates?

Background questions & items:

* What other factors is solar panel adoption related to?
* How are adoption rates related to
  + income
  + government rebates
  + decreasing installation price
  + utility company service areas

through time?

* Which locations have hotspots/coolspots and how are they related?

Study Area:

I will begin the analysis by studying the entirety of California. As I continue to discover interesting insights, I plan to refine the study area into a particular county/zip code.

Hypothesis:

It is well known that as the price of solar power has decreased, the adoption of this green energy has spread, but this spread has not been adopted by all, equally. Income level, government rebate programs, and utility service coverage play a key role in determining a household’s likelihood of solar panel installation.

1. *Methods*

Dataset: <https://www.kaggle.com/datasets/arnavsharmaas/solar-panel-pv-system-dataset?resource=download>

The data describes 1 million solar panel installations across the California from 1998-2019. Each entry is a different installation with the accompanying information about the installation. The data is extremely comprehensive, detailing with 76 distinct features. Of the 76, the most important are

* Zip code
* City
* System size (DC)
* Rebate or Grant
* Total Installation Price
* Utility Company

Due to the expected messiness of the data, the preprocessing will likely occur using ArcPro SQL and selections and Python pandas library.

Tasks:

1. Determine the service areas of different utility companies.
   1. Using this, determine if there are any differences in uptake by utility company area.
2. Import and analyze census income data from ESRI databases.
3. Emerging Hot Spot analysis in number of installations per year per zip code.
4. Develop a storymap detailing my findings.
5. *Expected Outcomes*

Completeness criteria:

1. Gradient coloring detailing the adoption of solar panels
2. Space-time cube of gradient colors
3. Hot Spot analysis of number of installations
4. Hot Spot analysis of System size (DC)
5. Hot Spot analysis of installation prices
6. Zip coding utility providers
7. Service area per utility provider
8. Hot Spot analysis of installation prices
   1. How does utility provider affect installation prices?
9. Import incomes from the ESRI census databases
10. Colocation analysis of income and number of installations

Predictions:  
I predict that the adoption of solar panels will be related to the income of the zip code. I believe that certain utility providers will affect the availability of solar panels and thus affect the number of installations in a zip code. I predict that more rural areas are more likely to install solar panels.

*4. Key References*

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