Solar Panel Initiative
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Introduction
Due to increased global temperatures and pollution, there is a growing need for clean energy sources. This project explores a fictitious government solution that includes:
- An initiative meant to generate renewable, solar energy for the south-western United States.
- Requires residents within specific counties to put solar panels on their roofs.

Methods
Selection Criteria for County and City Data:
1. Selected By Attribute Within “Counties” Shapefile
   • Median Household Income > $45,000
     - Created new layer from selection
2. Selected By Attribute within “Cities” Shapefile
   • Average, Annual Temperature < 70
   • Mean, Annual Clear Days > 170
   • Mean, Annual Cloudy Days < 140
     - Created new shapefile from selection
3. Selected By Location using the New City Selection and County Selection Shapefiles
   • Select Counties that Contain the Cities Selection
     - Created new layer from selection
4. Rank the counties based on weighted parameters:
   Weight rankings out of 100%
   1. Clear Days (70%)
   2. Average Temp (20%)
   3. Median Income (10%)

Weighted Index Equation (WIE) in Excel:
\[ \sum (\text{Avg Annual Clear Days}^0.7) + (\text{Avg Annual Temp}^0.2) + (\text{Med Household Income}^0.1) \]

5. Based on rankings from WIE above (shown on map):
   • Performed Supervised Classification using NAIP Imagery.
   • Symbolized brightness levels by land types.

Results of Analysis

Data
Acquired Data:
- US Generalized Counties
- 2010 Temperature Raster
- Historical Climate Data
- 2010 County Census Data
- NAIP Imagery of Phoenix, AZ

Best County Locations for Solar Panel Initiative
Southwestern United States

Resulting Counties Selection:
- Clark
- Kern
- Maricopa
- San Joaquin
- Humboldt
- Los Angeles
- Placer
- Santa Barbara

Resulting County Ranking:
1. Maricopa
2. Clark
3. Kern
4. Los Angeles
5. San Joaquin
6. Santa Barbara
7. Placer
8. Humboldt

Conclusion
- 8 counties qualify for the initiative.
- Maricopa was ranked first after our WIE.
- Our supervised classification showed us the available rooftops of a suburb in Phoenix, AZ.

Shortcomings:
- Lack of data (City points, weather data for all counties).
- Only Western United States was studied due to time constraints.
- Supervised Classification has limited accuracy.
- Time constraints did not allow us to analyze statistic of a Maximum Likelihood Classification.

Moving Forward:
- Could use all 3,144 counties of the United States for a larger analysis.
- Perform a Maximum Likelihood Classification to determine the percentage of available rooftops for solar panel installation.

References
- Armstrong S., Hurley W.G., "Renewable Energy: A new methodology to optimize solar energy extraction under cloudy conditions" no. 35 (780–787)
- PRISM Climate Group
- Western Regional Climate Center
- US Census Bureau
- USDA