Solar Panel Energy Prediction Study

Group member: Chongyang Shi (11813214@mail.sustech.edu.cn)

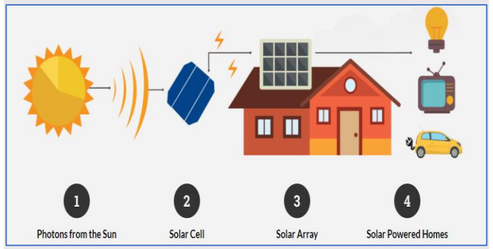
Professor: Majed Al-Ghandour (mnalgha@ncsu.edu)

PURPOSE

The main question is whether utilizing solar panels are a more cost efficient alternative when all costs are factored in. This research study will benefit both the interested consumer and the solar panel manufacturers.

INTRODUCTION

Question: What is solar?



1. Photons from the sun
2. Solar cell
3. Solar array
4. Solar powered homes

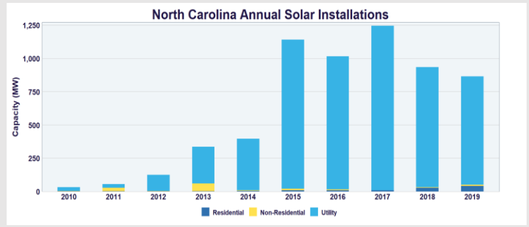
METHODOLOGY

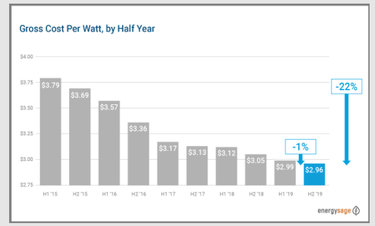
- Dividing systems into three Types: Residential, Commercial Building, and Farm Solar Energy. Solar Energy
- Applying Computer vision project to recognize the three types of solar panel systems.
- Applying Data science, data analytics, and machine learning algorithm to predict the energy.
- Applying Investment return analysis (ROI) to give this investment a reasonable evaluation.

PRODUCT & RESULT

Task 1. Literature Review

Complete a literature review, the content is to analyze the use and consumption of solar energy in the United States, and give the analysis methodology





Sky Cover	Visibility	Relative H	Average Wind	Average B	Power Ger
0	10	75	8	29.82	0
0	10	77	5	29.85	0
0	10	70	0	29.89	5418
0	10	33	0	29.91	25477
0	10	21	3	29.89	30069
0	10	20	23	29.85	16280
0	10	36	15	29.83	515
0	10	49	6	29.86	0
0	10	67	6	29.86	0
0	10	49	0	29.87	0
0	10	54	0	29.9	4939

Task 2. Data Collection & Processing

- Weather and rain data
- Cost of solar panel kits
- Average solar cost data

Build a data environment, such as data preparation, cleansing, meta data, and ETL (Extract Transform Load)
Create Solar Energy Data Dictionary definitions and standards to store in data warehouse on the Cloud (AWS or Azure or Google)

Task 3. Computer Vision Project

Apply the package OpenCV to recognize the photo. This computer vision project can identify photos and determine which type of solar panel system the solar panels on the photos belong to.

- Residential Building
- Commercial Building
- Farm Solar Energy

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(4032, 3024, 3)
1. greenhouse, nursery, glasshouse (580): Probability 92.0%
2. chainlink fence (489): Probability 0.888%
3. tile roof (858): Probability 0.662%
4. window screen (904): Probability 0.61%
5. mobile home, manufactured home (660): Probability 0.309%
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	Coefficients	Standard Error	t Stat	P-value	ower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	-31030.83895	30108.77483	-1.031	0.3028027	-90068	28006	-90068	28006
First Hour of Period	-45.80867503	18.14477077	-2.525	0.0116351	-81.39	-10.23	-81.39	-10.23
Distance to Solar Noon	-22625.43578	434.5680986	-52.06	0	-23478	-21773	-23478	-21773
Average Temperature (Day)	-67.6705735	20.36973536	-3.322	0.0009044	-107.6	-27.73	-107.6	-27.73
Average Wind Direction (Day)	44.91383805	18.68585454	2.4036	0.0162955	8.275	81.553	8.275	81.553
Average Wind Speed (Day)	-33.7530485	35.91361101	-0.94	0.3473777	-104.2	36.666	-104.2	36.666
Sky Cover	-837.4906726	93.1004417	-8.996	4.14E-19	-1020	-654.9	-1020	-654.9
Visibility	174.5908134	91.30012234	1.9123	0.0559392	-4.429	353.61	-4.429	353.61
Relative Humidity	-149.9458858	9.871818706	-15.19	3.339E-50	-169.3	-130.6	-169.3	-130.6
Average Wind Speed (Period)	163.5991999	23.77375863	6.8815	7.224E-12	116.98	210.21	116.98	210.21
Average Barometric Pressure (Period	2080.897069	978.4281813	2.1268	0.0335227	162.41	3999.4	162.41	3999.4

Task 4. Data Prediction Model

- Predict column (Power Generated) by using the first cut MLR (Multiple Linear Regression).
- All red variables need to be ignored since p value of them are blew 0.05.

INTERPRETATION

Temperature, sky cover and visibility has a significant impact on the amount of solar energy received by panels.

The development of science and technology has continuously reduced solar energy costs.

CONCLUSION

- The weather data like temperature, wind direction, sky cover, visibility which has correlation with sunshine will have a sign significant impact on the amount of solar energy received by panels. Therefore, It's better to choose a sunny state to install the solar panel system.
- As the cost of solar panels has been declining in recent years, it will be a wise choice to invest in solar panels in the future.

FUTURE

- Collecting data on the solar generation of commercial buildings and farms.
- Predicting solar generation of commercial buildings and farms.
- Conducting a comprehensive evaluation of the investment on the solar panels.

Commercial

Farm