Abstract
Solar energy is largely influenced by weather events. These events can not only influence the availability of energy, but the stability of the entire power grid. Our goal is to utilize previous solar panel and weather data using Machine Learning to predict the availability of energy in the future. This will allow optimal energy management decisions that can help reduce costs and increase efficiency.

Rutgers Systems

- Livingston Solar Canopies
  - Solaire Canopy: Solaire 360 D
  - Number of Canopies: 45
  - System Size: 8 MW
  - Number of Panels: 31,032
  - Panel Size: 260W
  - Panel Manufacturer: Yingli
  - Inclination: 15º / 1º
  - Number of Columns: 482

Preliminary Analysis
The data analysis indicated that humidity, cloud cover, and temperature are relevant factors that affect solar irradiance.

Research Challenges
- Solar Energy generation is unpredictable therefore, it is hard to take into account when you’re planning power sources
- The solar panels only have 4 years of data, so when making a prediction model, insufficient data may cause inaccuracy.

Methodology
Using Machine Learning, SolarSmarts predicts an accurate GHI value based on weather data, existing solar data, and theoretical GHI values.

Results
- After developing a model to predict solar irradiance trained by data from 2013 to 2015, the model was used to make predictions for 2016. The result of our prediction for 2016 was tested against the experimental data for that year.
- The average percent-error between our predicted and experimental values was 22.998%, showing that the model was capable of making accurate predictions.

End-Use
- SolarSmarts allows for accurate prediction of energy generated for the upcoming week. Thus, the amount of energy required from controlled sources can be determined.
- The ability to predict solar energy allows making informative decisions pertaining to energy storage requirements.
- Anomalies can be detected by our system, allowing users to identify potential issues with their solar panels.

References
[3] https://darksky.net/dev/docs