# Predicting Solar Power Generation from Weather Forecasts Using Machine Learning Models

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## 1. Motivation

Energy from the sun is an inexhaustible resource that creates little to no pollution. However, current methods of collecting solar energy and converting it to electricity can capture and store only a small amount of the available energy from the sun at any given time. The highly variable nature of solar energy production puts stress on fossil fuel based power generation. We aim to predict solar intensity for a given area 24 - 48 hours into the future using local time-series weather data. Our goal is to provide high-confidence forecasts of solar generation (via solar intensity) using readily-available weather data. This will enable better regulation of fossil fuel based power generation. We have acquired solar intensity and weather data from NSRDB[2]. This project aligns with our sustainable development goals and deploying machine learning techniques to solve real world problems.

## 2. Related Work

One study explores ways to predict solar generation from Weather Forecasts using various Machine Learning Models[4].

Another studies the impact of cloud cover and dust on performance of solar cells[1].

One paper studies influence of light intensity on performance of solar cells[5].

Another paper explores solar power forecasting using artificial neural networks[3].

## 3. Timeline

1. Data pre-processing [1 week]

2. Exploratory Data Analysis (performing experiments and applying baseline models) [2 weeks]

3. Apply different predication models and metrics such as Linear Regression, SVM, K-Means Clustering [5 weeks]

4. Write report and presentation [2 weeks]

## 4. Individual Tasks

1. Kushal - Data preprocessing, Linear Regression, SVM

2. Naval - Data analysis, Linear Regression, SVM

3. Rishi - Data preprocessing, Linear Regression, K-means clustering

4. Udit - Data analysis, Linear Regression, K-means clustering

All four of us will equally contribute towards report making. We will divide implementation of various Linear Regression techniques amongst ourselves.

## 5. Final Outcome

This project aims at using various machine learning techniques to predict solar intensity in near-future using time series weather data. By limiting the uncertainty of predicted solar forecasts, such a model has the potential to allow grid sites to reduce the production of fossil fuel based power.

Our project will help us gain insight in various prediction techniques, as well as most important features to consider from the NSRDB [2] dataset.

## References

[1] Abdoulatif bonkaney, sa¨ıdou madougou, rabani adamou, "impacts of cloud cover and dust on the performance of photovoltaic module in niamey". https://doi.org/10.1155/2017/9107502.

[2] https://nsrdb.nrel.gov.

[3] M. abuella and b. chowdhury, "solar power forecasting using artificial neural networks," 2015 north american power symposium.

[4] N. sharma, p. sharma, d. irwin and p. shenoy, "predict-ing solar generation from weather forecasts using machinelearning," 2011 ieee international conference on smartgrid communications.

[5] Zhe li, jian yang, pouya asareh nejad dezfuli, "study on the influence of light intensity on the performance of solar cell". https://doi.org/10.1155/2021/6648739.