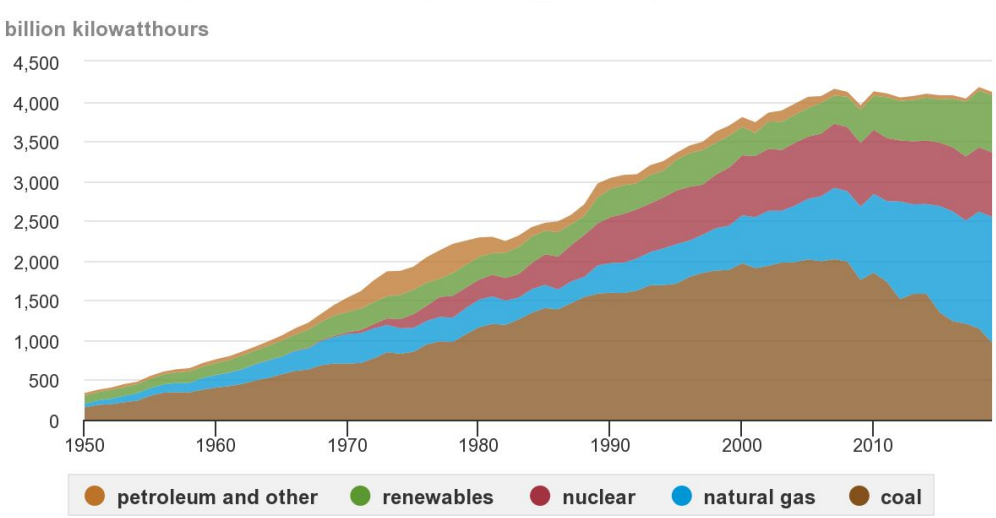
Solar Energy Forecasting

By: Matt Carr

Project Overview

Problem:

- Conventional energy sources are harmful to environment
- Renewable sources are intermittent and difficult to integrate into current grid



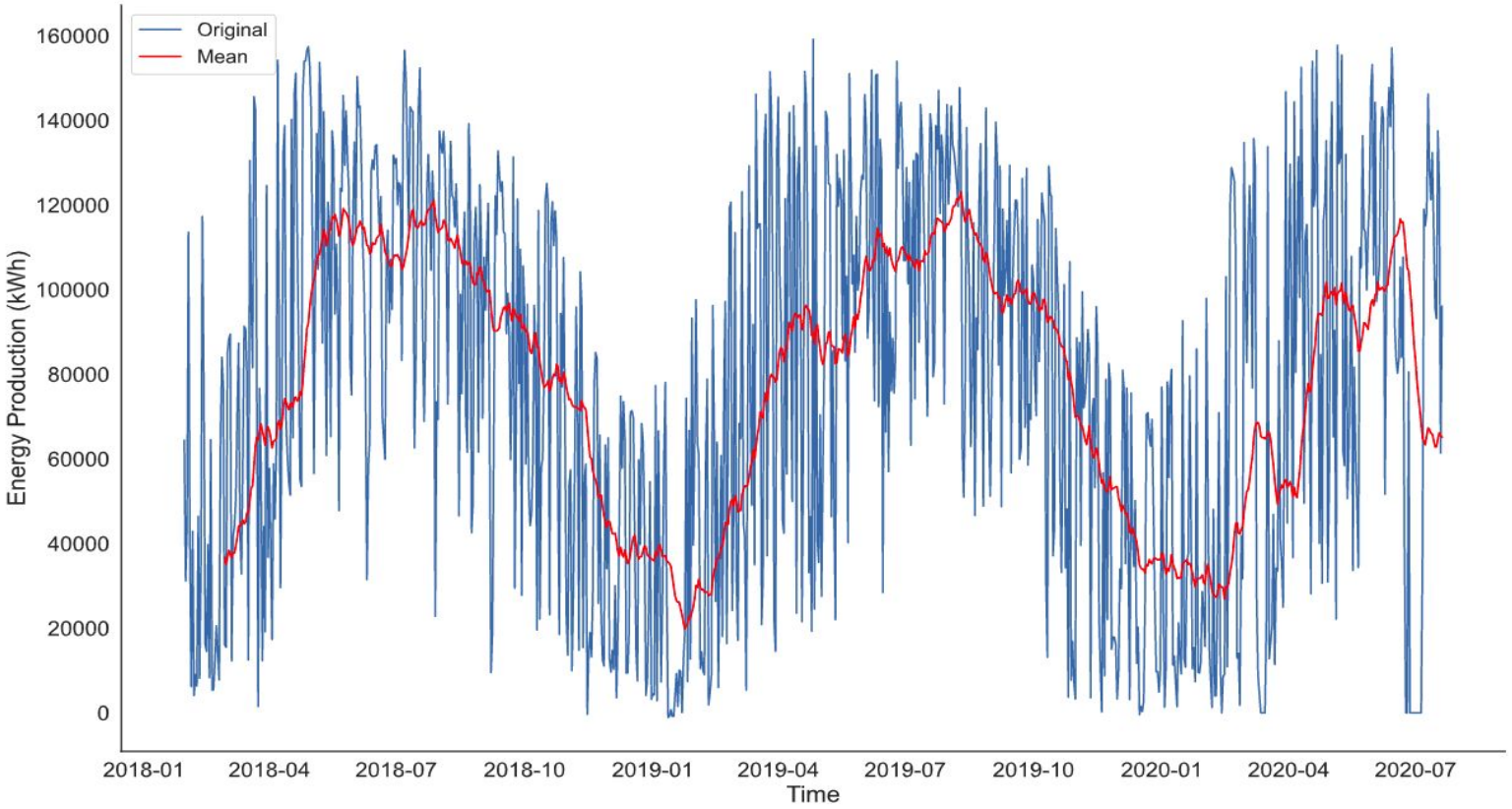
Note: Electricity generation from utility-scale facilities.
Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 7.2a, March 2020 and *Electric Power Monthly*, February 2020, preliminary data for 2019

https://www.eia.gov/energyexplained/electricity/electricity-in-the-us.php

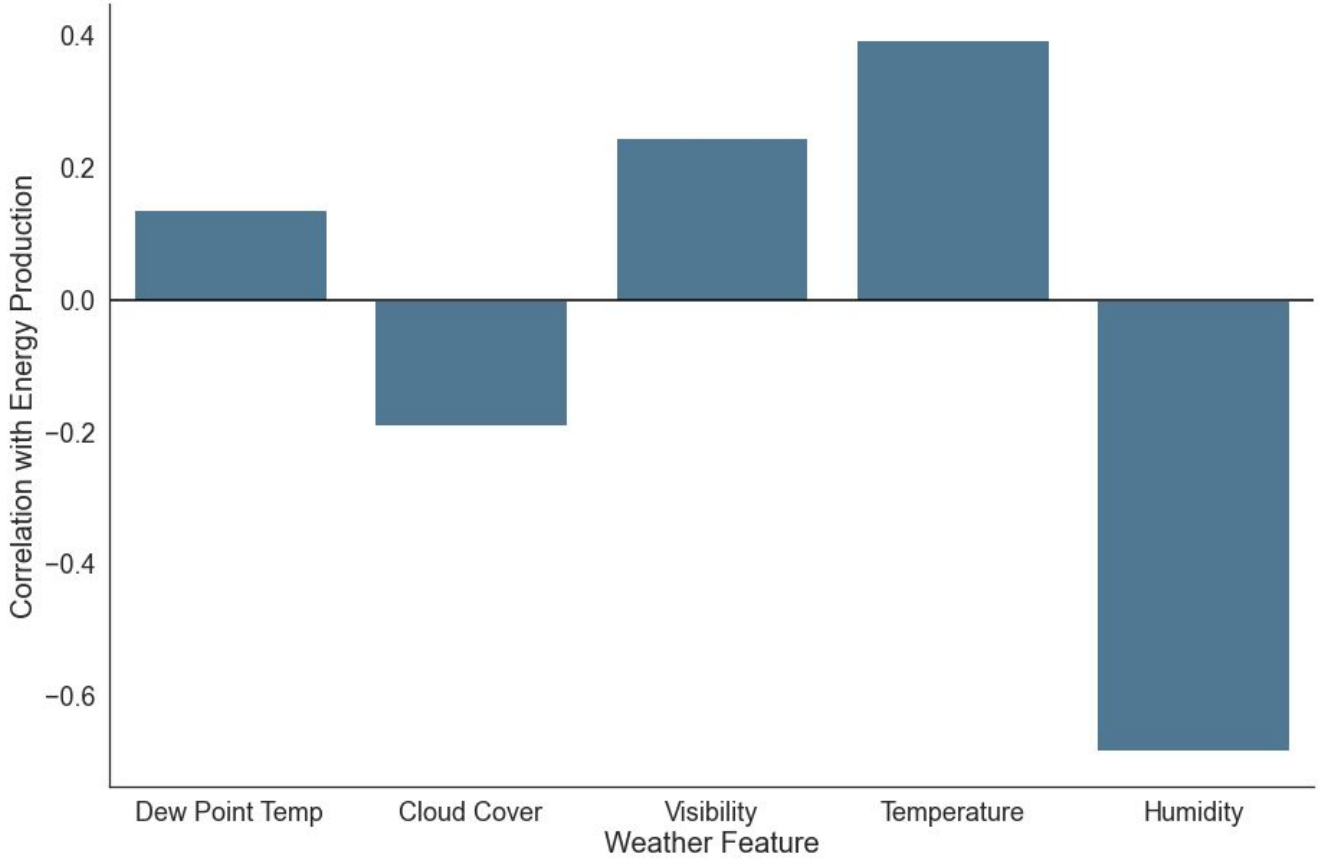
Data

- Gathering
  - Energy ➡ University of Illinois Solar Farm Dashboard
  - Weather ➡ NOAA Local Climatological Data
- Prep
  - Aggregate to hourly time index
  - Combine energy and weather data
- Result
  - Hourly data from January 30, 2018 to July 20, 2020

Energy Fluctuation



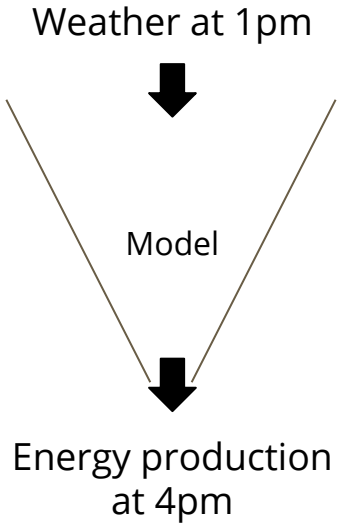
Weather Dependence



Solution

Create a model that can predict solar energy production in advance

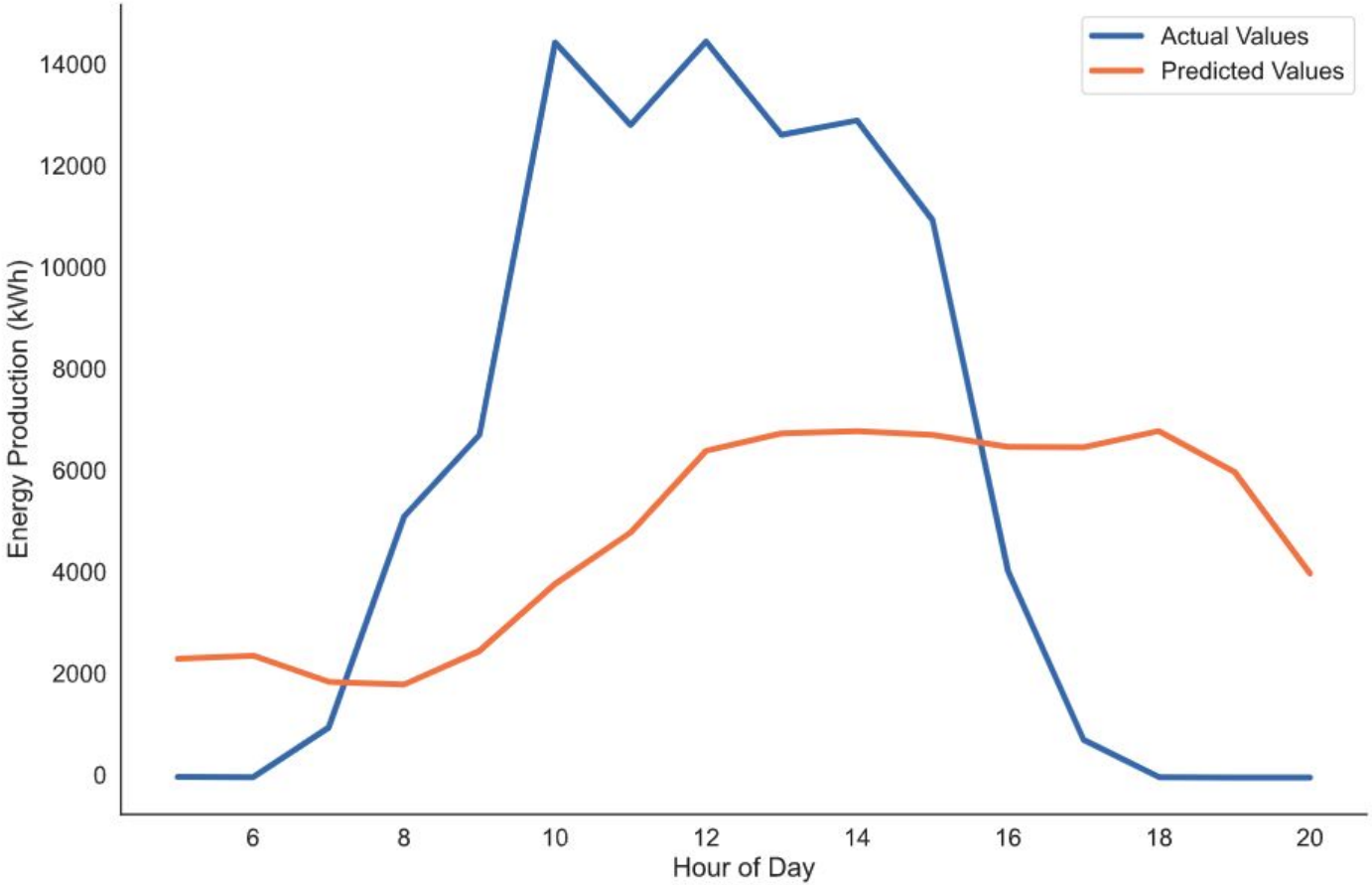
Example



Modeling

- Data Prep
  - Three hour lag between energy and weather data
  - Filtered for times between 5am and 8pm
- Data Split
  - Training: 75% ~ 11,000
  - Testing: 25% ~ 3,500
- Metric
  - RMSE

Baseline Model

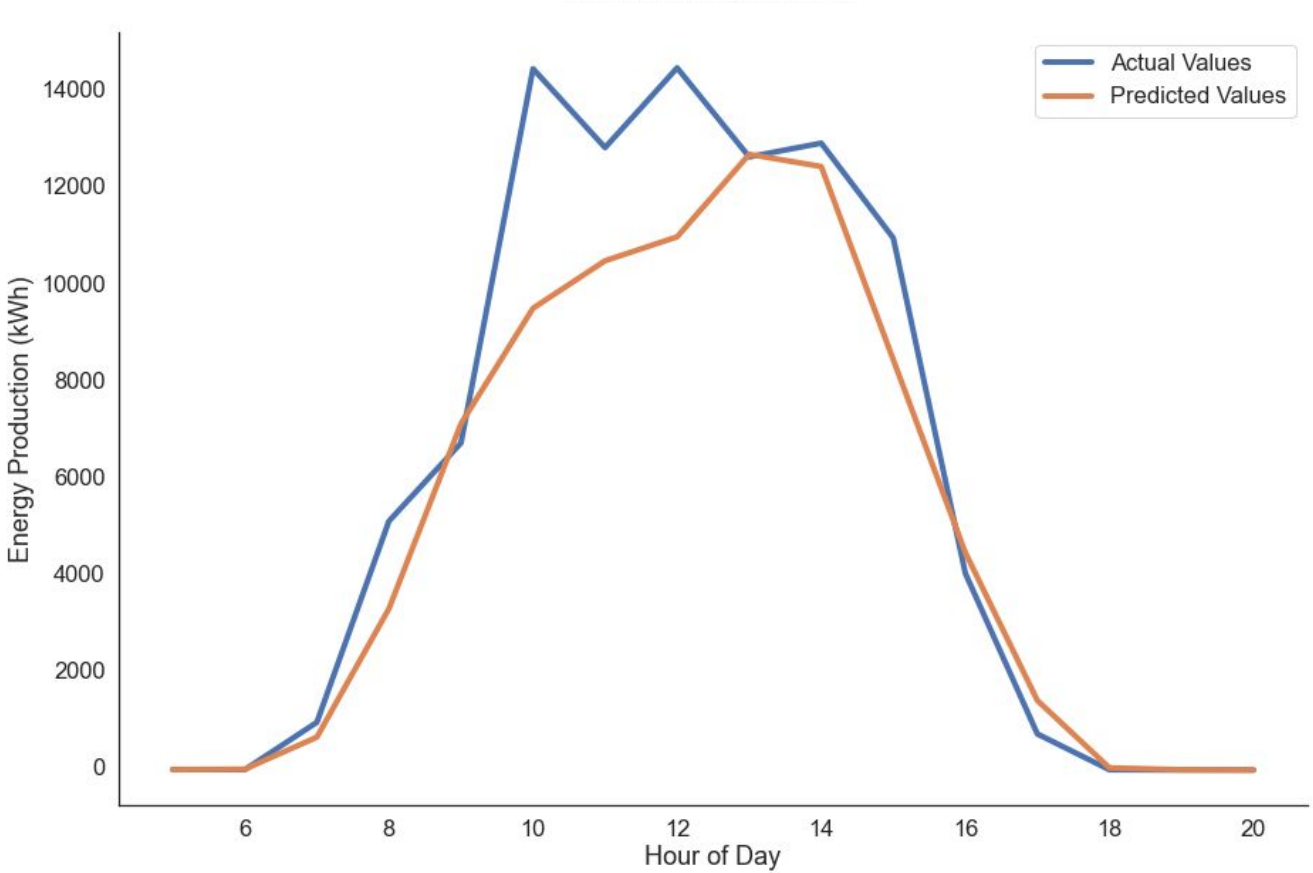


Day: October 19, 2019

Base Features

RMSE: 5030

Best Model



Day: October 19, 2019

Base Features and Time

RMSE: 2297

Next Steps

- Include solar radiation data
- Include weather forecasts
- Time series modeling
- 1-6 hour forecast

Stretch Goals

- Deploy as flask/dash app

Contact Info

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Project Repo: github.com/mattcarr17/solar_energy_prediction