

An aerial photograph of a vast solar farm. Rows of blue solar panels are laid out in a grid pattern across a green field. A light-colored dirt path or road runs through the center of the panels, leading towards the horizon. In the background, there are green trees and a small body of water under a cloudy sky. The text 'Solar Power Forecasting' is overlaid in the center in a large, bold, black font. The author's name 'By: Ozair Ahmed' is written below it in a smaller, regular black font. There are two brown L-shaped decorative lines, one on the left and one on the right, framing the text.

# Solar Power Forecasting

By: Ozair Ahmed

# About Project

- Help solar plants forecast output
- This will help grid operators manage supply and demand
- 2 Goals:

**1**

## **Forecast Solar Output**

Two days out

Use weather forecast

**2**

## **Analyze Inverter Performance**

DC → AC Conversion

Find inefficient inverters

# About The Data

From Kaggle

Two Solar Power Plants:

- Nashik, India (1)
- Gandikota, India (2)

Includes:

- DC, AC, & Daily Yield (kW)
- Ambient & Module Temperatures

5/15/2020 - 6/17/2020 (34 days)



# I. Forecasting Solar Output

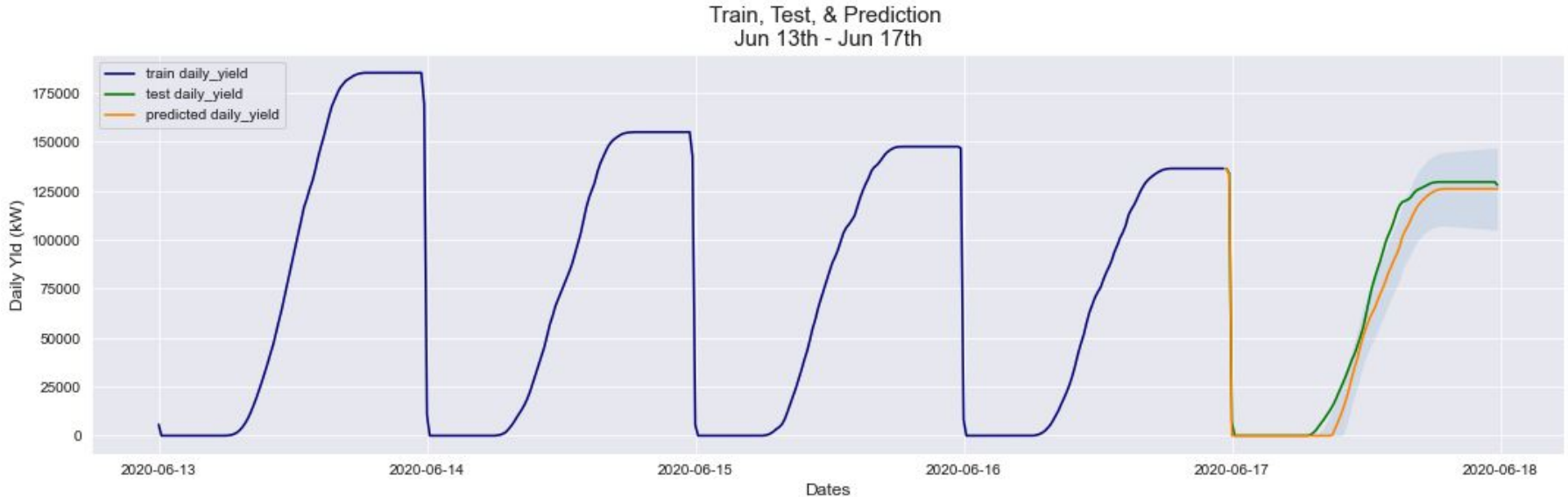
Models used:

- SARIMA
- Facebook Prophet
- SARIMAX (w/ ambient temperature)

5 days to train & test model: 6/13 to 6/17

Forecast output for next 2 days: 6/18 & 6/19

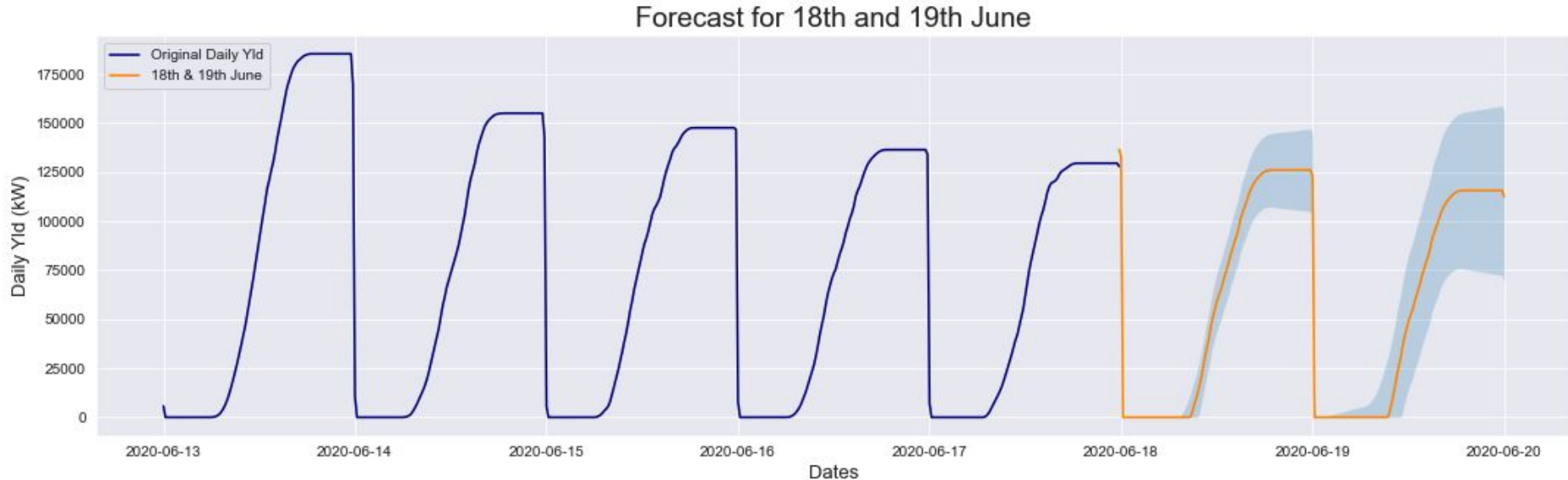
# SARIMA: Training & Testing



$R^2$  Score: 0.977 Mean Absolute Error: 6148.57

RMSE: 8743.15

# SARIMA: Two Day Forecast



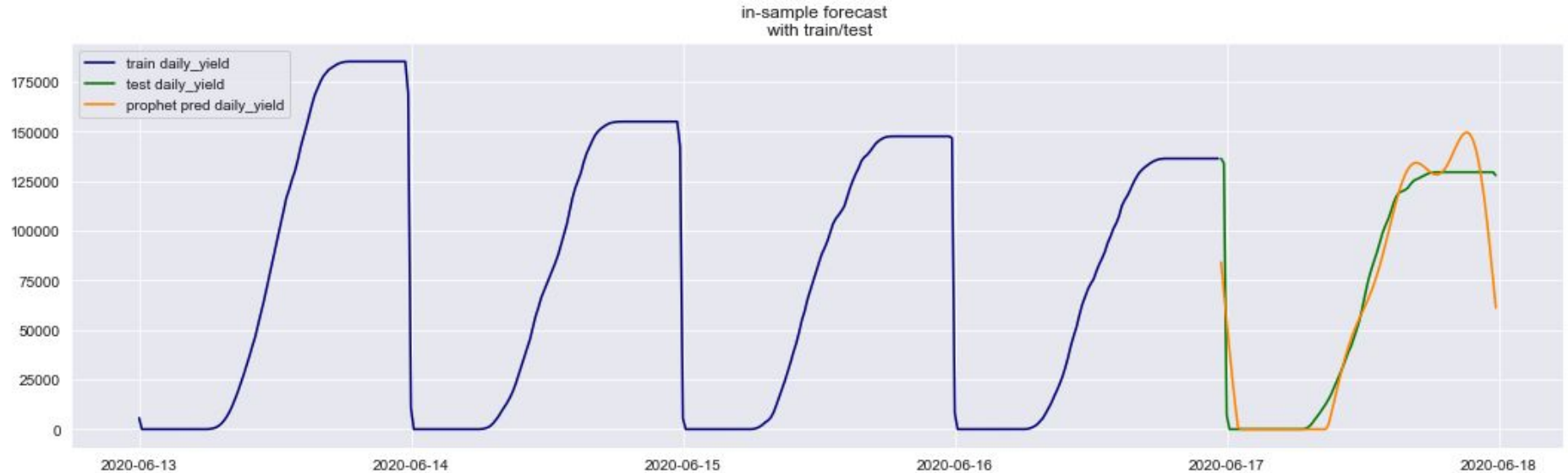
## 18th June

Daily Yield: ~133,100 kW  
~23,350 households (in India)

## 19th June

Daily Yield: ~122,800 kW  
~21,500 households (in India)

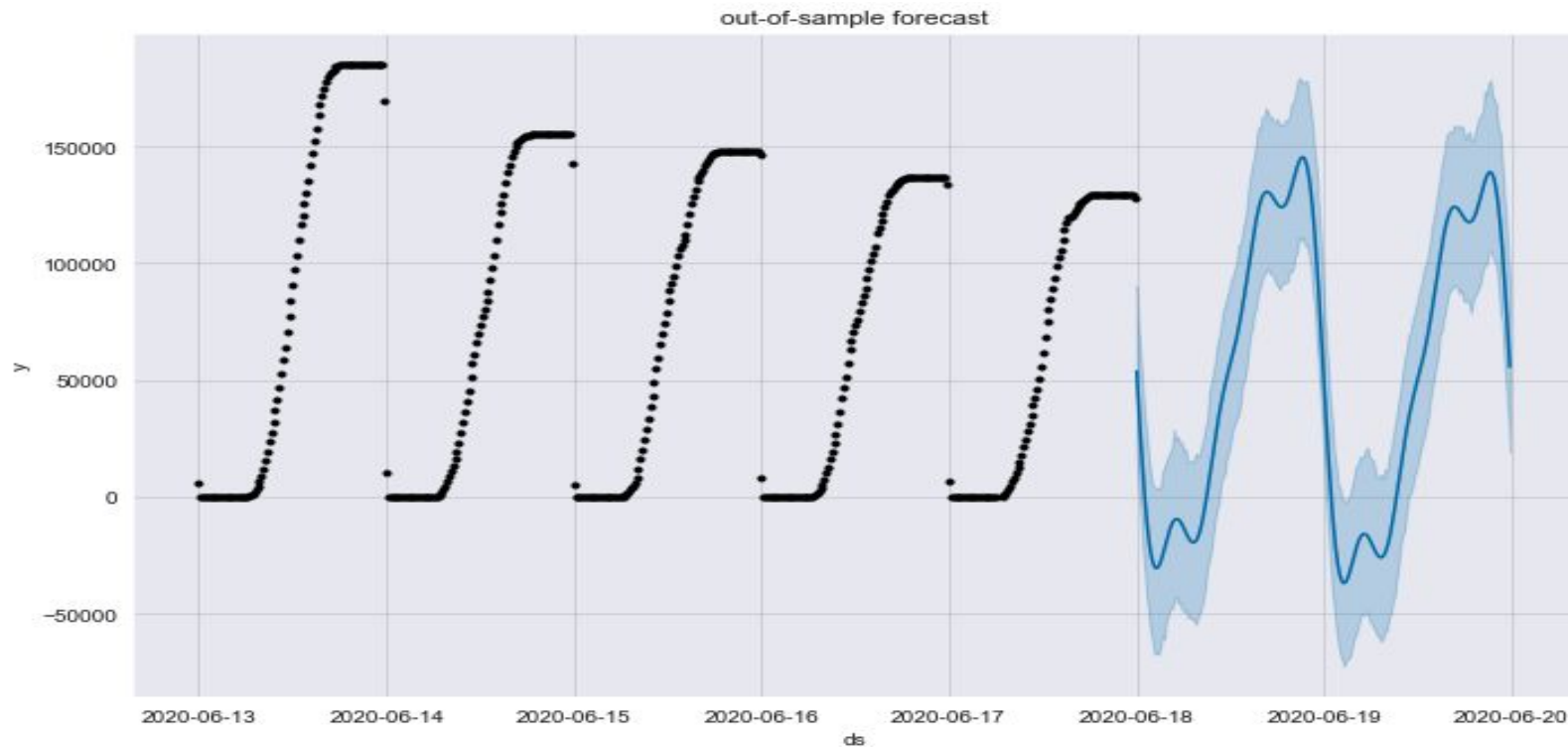
# FB Prophet: Training & Testing



$R^2$  Score: 0.921 Mean Absolute Error: 8480.88

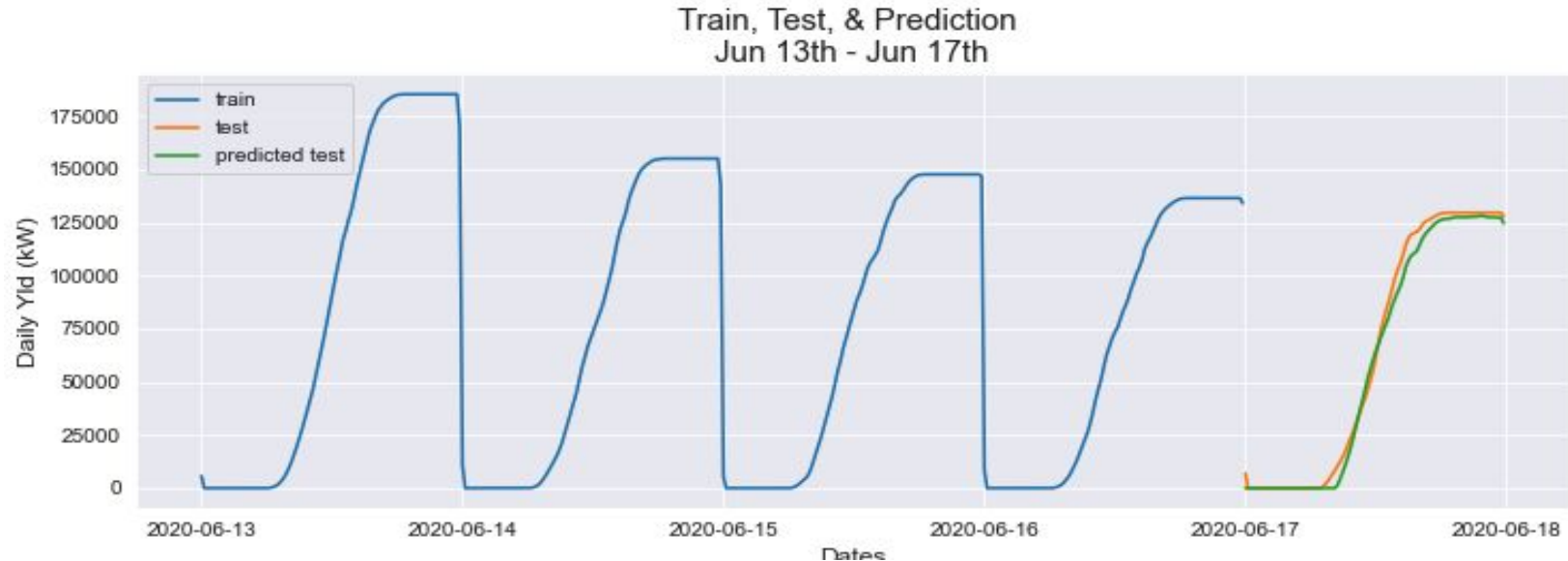
RMSE: 16160.54

# FB Prophet: 2 Day Forecast





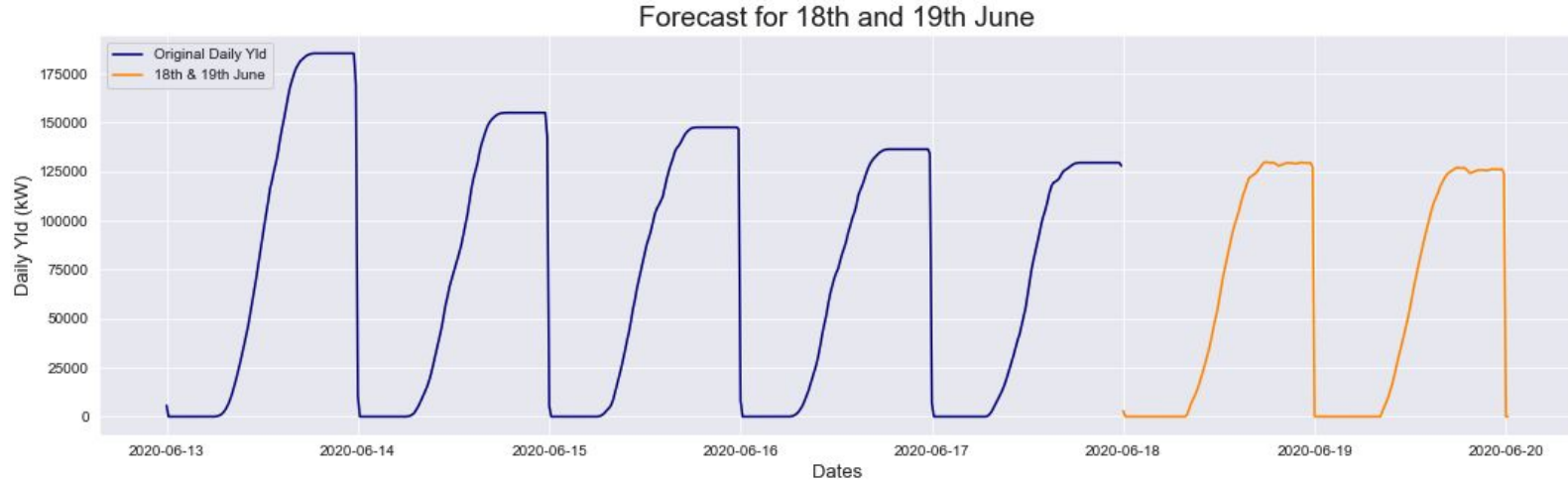
# SARIMAX: Using Ambient Temp



$R^2$  Score: 0.993 RMSE (train): 7899.64

RMSE (test): 4629.70

# SARIMAX: Two Day Forecast



## 18th June

Daily Yield: ~130,000 kW

~22,780 households (in India)

## 19th June

Daily Yield: ~127,000 kW

~22,283 households

# Future Improvement Ideas:

- LSTM Neural Network performance
- Gather more weather data and see correlation with power output
- Extend analysis to wind farms
- Deploy my model online

# Contact Info

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