Developing future with solar solutions

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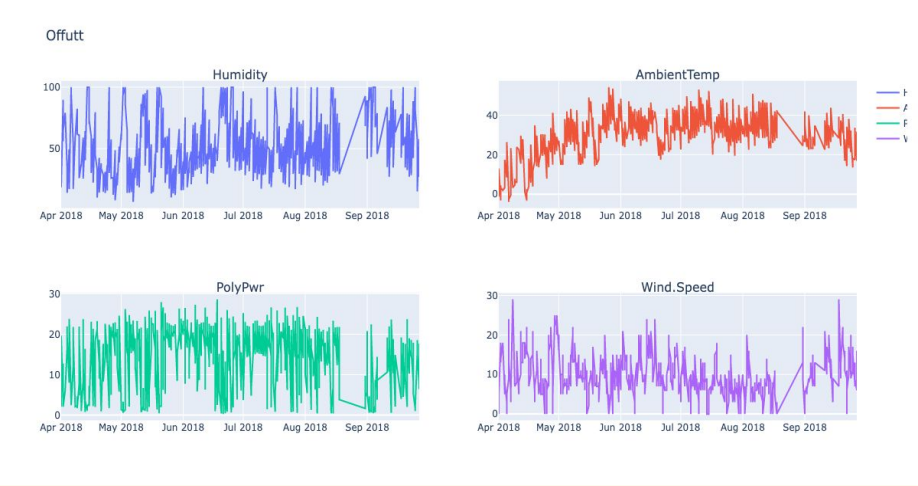
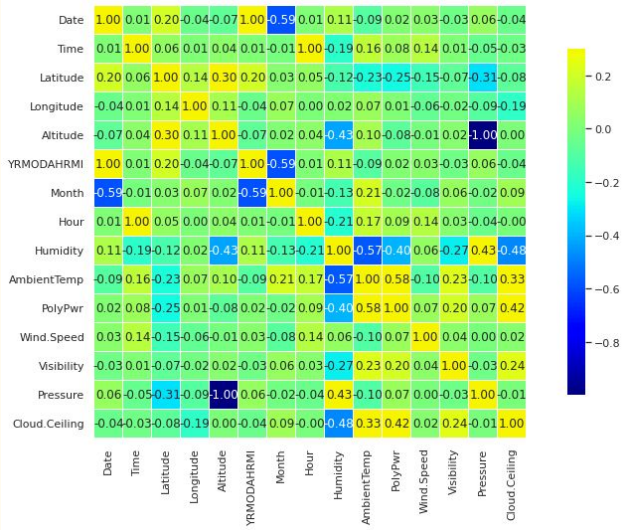
Problem Statement

Are you ready to go green?
Is your location feasible and efficient to install a solar panel?

- As of 2020 Research, 3% of total US electricity comes from solar energy
- Installation of solar panels are dependent on the weather condition and geospatial factors of the region.
- It can be costly to install solar panels with wrong geographical conditions without analysing it first.





KNOW THE DATA

- In our dataset, we have multiple factors that we are accounting to calculate the power output for the solar.

- The factors are:
  - Longitude,Latitude,Altitude
  - Humidity
  - Ambient Temperature
  - Wind Speed
  - Visibility
  - Season
  - Pressure
  - Cloud Ceiling

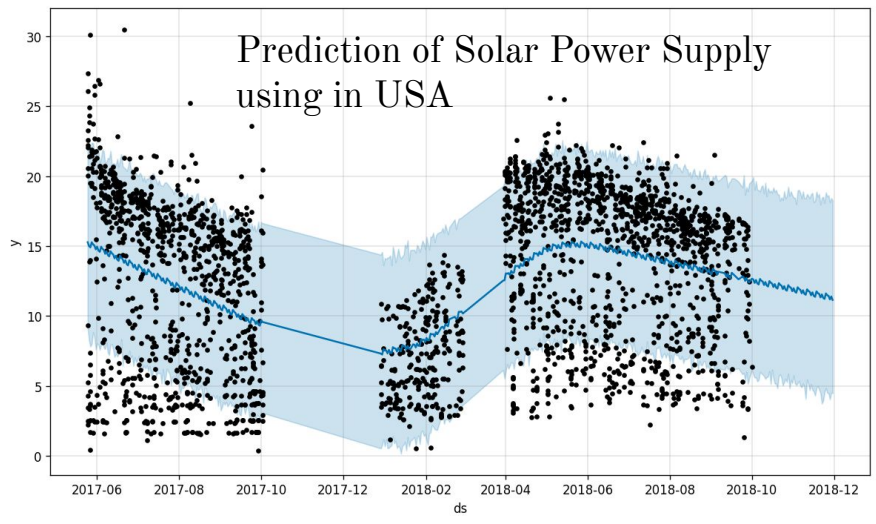
Technical Solution

Performed a Comparative study on numerous tree-based regression models, linear models and Time series models to predict the average power generated by the solar panel for 30 days.

Model	Adjusted R-Squared	R-Squared	RMSE
RandomForestRegressor	0.68	0.68	4.04
LGBMRegressor	0.67	0.67	4.07
XGBRegressor	0.67	0.67	4.1
MLPRegressor	0.66	0.66	4.15
BaggingRegressor	0.64	0.64	4.25
GradientBoostingRegressor	0.63	0.63	4.31
NuSVR	0.62	0.62	4.41
SVR	0.61	0.61	4.45
KNeighborsRegressor	0.59	0.59	4.55
RidgeCV	0.51	0.52	4.96
Ridge	0.51	0.52	4.96
LassoCV	0.51	0.52	4.96
ElasticNetCV	0.51	0.52	4.96
SGDRegressor	0.51	0.52	4.96
LinearSVR	0.51	0.51	4.99
AdaBoostRegressor	0.44	0.45	5.3

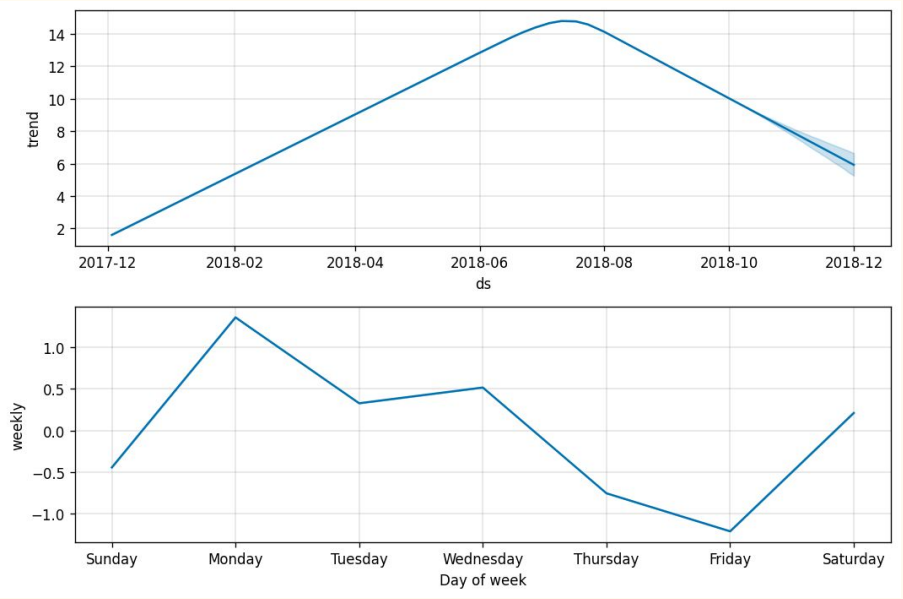
Analysis Support

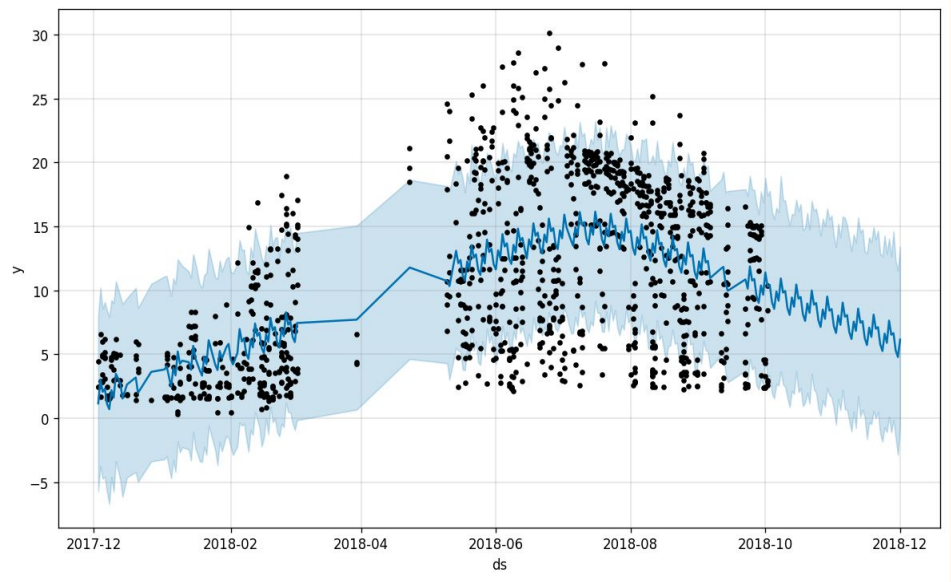
- Performed Prediction using FbProphet
- Computed the efficiency of the model based on Root Mean Square Error.
- The RMSE value for predicting average power over the numerous locations is 4.20

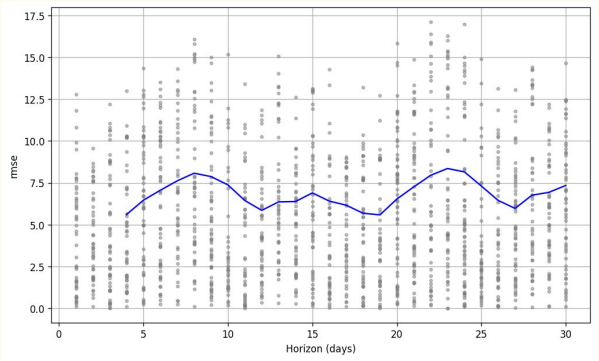


LOCATION	FbProphet (RMSE value)
Camp Murray (WA)	5.57
Grissom (IN)	6.98
Hill Weber (UT)	6.10
JDMT (FL)	6.64
Kahului (HI)	7.08
Malmstrom (MT)	5.83
March AFB (CA)	3.90
MNANG (MN)	6.33
Offutt (IA)	6.25
Peterson (CO)	5.32
Travis (CA)	5.16
USAFA (CO)	4.20

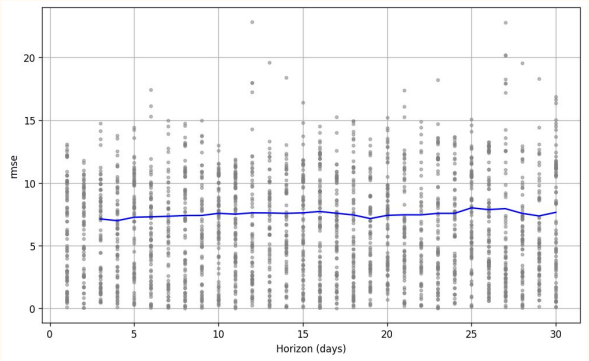
CAMP MURRAY POWER PREDICTION



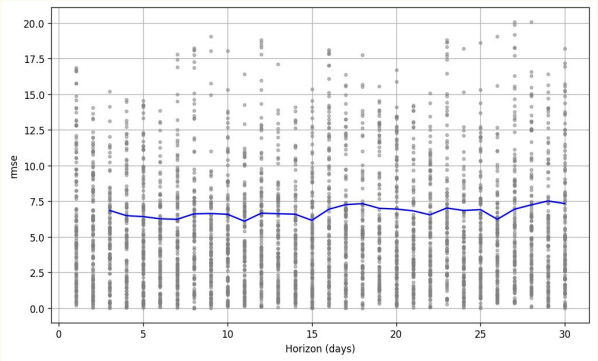




CAMP MURRAY



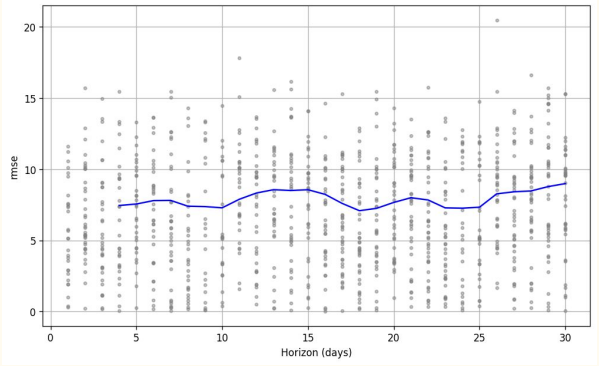
GRISSOM



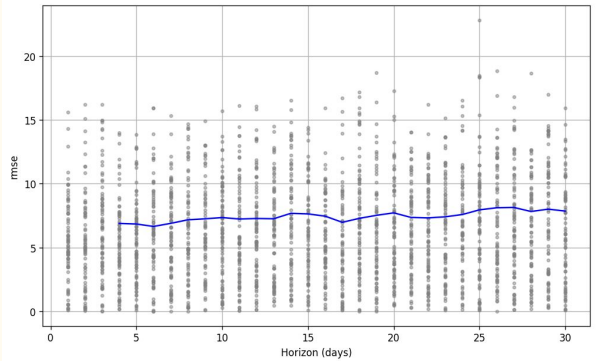
HILL WEBER

RMSE TRENDS at various locations

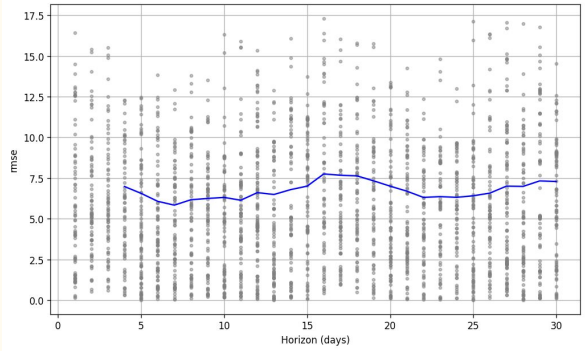
JDMT



KAHULUI



MALMSTORM



Social Impact: We can now find feasible locations to install the solar panels which is a clean and carbon-free renewable energy.

Feasibility: The overall installation cost of the solar panels can be minimised over a span of 10 years in comparison to using electricity. Additionally, once installed, it has a very low maintenance cost.

Scalability: We have used geospatial data from 10 states around United States to find the feasibility of solar panel installation. It can be scaled to other countries creating an eco-friendly solution.

Future work

Having calculated the feasible locations to install solar panels, we can create awareness to people of that region to install solar panels as it is a greener and more sustainable source of energy. Moreover, the costs of installing the panels can be break-evened between 9 to 12 years propelling us towards a clean and carbon-free future!