

Individual section report

Machine Learning Report - Gr X

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Machine Learning Report

Introduction

Solar energy stems from the Sun's radiation, one of the most abundant available resources of renewable energy on Earth. California is one of the most dynamic states in the United States, and its energy patterns reflect its diverse and dynamic economy. California's commitment to sustainability and environmental stewardship of natural resources is commendable. It ranks among the states in terms of energy consumption due to its large population and various industries. California can be considered as a pioneer in promoting various renewable energy such as solar, wind, and hydroelectric power. This state has policies to incentivize the adoption of clean energy technologies, resulting in a significant share in California's electricity generation. Harnessing solar energy by converting sunlight directly into electricity is the photovoltaic effect, which is Photovoltaic (PV) technology. As of 2023, the U.S. installed 32.4 gigawatts (GW) of new solar Photovoltaic (PV) capacity which accounts for a 51% increase from 2022

<https://www.solarpowerworldnews.com/2023/07/us-installs-more/>

154 words

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Technical Difficulties

- By following this structure, we wrote a Python script to read multiple files from each folder, affix zip code as a column extracted from the folder name, and then append all these datasets together into a master data frame - this ensures that we can differentiate between the multiple datasets combined
- We need to figure out a scalable method of excluding dark hours (irradiance=0) from our dataset - this is challenging since it varies across seasons
- We could not run a polynomial regression model on our dataset in the local machine and the HPC lab, but we could not run as it was computationally expensive.

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1 Predicting Solar Irradiance to Sustaina...

The predictive performance of various machine learning regression models was evaluated using diverse Evaluation metrics like MSE, RMSE, MAE, MAPE, MEDAE, R-Squared, and MSLE. This section details the performance of each of the machine learning models.

Linear Regression resulted with an R^2 value of 0.8033, indicating it can explain about 80% of the variance in the solar irradiance dataset. The residual plot visualizing the actual vs predicted values is shown in Figure 5.

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Fig. 5. Residual plot for Linear Regression

Random Forest Regression Model The tuned Random Forest Regression model outperforms the other models with a mean squared error of 2907.10 and an R-squared value of 0.971. These metrics suggest that the tuning process may have introduced adjustments that affect the model's predictive accuracy, potentially influencing its ability to generalize well to new data. The feature importance plot for Random

Review suggestions 42

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Engagement

Delivery

Style guide

Use consistent punctuation
"straight"

Add a comma
etc

Add a hyphen
straight line

Change the verb form
is

Correct article usage
maximum

Rephrase sentence
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