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Modelling Weather Patterns and Solar PV systems for the Sizing of Standalone PV Battery Charging System Standalone PV Battery Charging System

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Introduction

However, designing an effective and efficient PV battery charging system requires careful consideration of several factors, including the weather patterns of the region.
Specifically, we focus on modeling the weather patterns of the region and the performance of the PV system under those conditions in order to identify the most suitable system configuration for reliable and efficient battery charging.
The study must develop a comprehensive model that can accurately predict the solar resource availability and energy production potential of the system, considering the variability of weather patterns and the performance characteristics of the PV panels and battery system.

Methodology

To investigate the use of weather patterns and PV system models for the sizing of standalone PV battery charging systems, we conducted a simulation-based study using weather data and PV system models for a rural region.
1. The historical weather data for the region collected, including variables such as temperature, solar irradiance, wind speed, and precipitation. We then used this data to develop a statistical model of the weather patterns for the region, including seasonal and daily variations.

Next, We will then use the weather and PV system models to simulate the performance of various system configurations for battery charging, including different panel sizes, battery capacities, and charge controller settings.
We will evaluate the performance of each configuration based on factors such as battery charge time, energy efficiency, and system reliability.
Finally, we will compare the performance of different system configurations and identify the optimal configuration for the given weather patterns and system requirements. Our results will provide insights into the use of weather data and PV system models for the design and optimization of standalone PV battery charging systems for Northern KwaZulu-Natal.

Result

The following figure showing the out of the Modell I already trained for the meteorological data, which shows the model is not performing well:

Whereby recall is a metric that measures the ability of a model to identify all relevant instances of a particular class or label in a dataset. Precision is a metric that measures the ability of a model to identify positive predictions correctly. The F1 score is a measure of a machine learning model's accuracy that considers both precision and recall. Accuracy is the measure of the model to do the right prediction.

Discussion

This study focused on the use of weather modeling techniques and solar PV system simulations to determine the optimal sizing of standalone PV battery charging systems for rural areas. The results highlighted the importance of accurately modeling both weather patterns and solar PV system performance in order to design an effective system. Cloud technologies such as Azure ML and Amazon SageMaker will be used to improve the

accuracy of the model. The study has important implications for the design and implementation of standalone PV battery charging systems in rural areas, helping to bring reliable and sustainable energy solutions to rural areas.

Conclusion

In this study, we have demonstrated the effectiveness of using weather pattern modeling in conjunction with solar PV system modeling to accurately size standalone PV battery charging systems for rural areas. By accurately sizing standalone PV battery charging systems, we can ensure that rural communities have access to reliable and sustainable energy sources that can improve their quality of life.

Apply to be considered for a student ; award (Yes / No)?

YES

Level for award;(Hons, MSc, PhD, N/A)?

MSc

Consent on use of personal information: Abstract Submission

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