Çisem Helvacı

SolarForecast

1. Project Name: “SolarForecast”: Solar Energy Production Forecasting Using Machine Learning

2. Overview

The purpose of this project is to develop a machine learning model that can forecast solar energy production of countries by using historical solar energy consumption data. Solar energy production data of countries in previous years will be examined and a model will be created for the prediction. 7th goal of sustainability: Affordable and clean energy is targeted in this project. By providing accurate predictions, the project supports efficient energy planning, the contribution of solar energy to energy production and overall sustainability efforts. Prediction of countries' solar energy production is essential for our future because sustainability projects would be built based on renewable energy sources, so countries can make their energy production plans according to these forecasts.

3. Background

As the world increasingly turns to renewable energy sources to combat climate change and ensure energy security, solar energy also has an important place. Solar energy is abundant, sustainable and environmentally friendly. Accurately forecasting solar energy production is crucial for optimizing energy resource management, ensuring supply and demand, and increasing the wider use of solar power. Observing the solar energy potential of countries and developing projects accordingly are the purpose of this project. Accurate forecasting contributes to effective energy planning, infrastructure development and policy making for countries. The project aims to examine historical solar energy production data in various countries to create a reliable forecast model. The dataset used in this project contains historical solar energy production data for multiple countries over several years, measured in terawatt-hours (TWh). Thus, this comprehensive dataset provides a solid foundation for developing an accurate forecasting model.

4. Key Objectives / Business Objectives

Research Question: How can we improve the accuracy of solar energy production forecasts using machine learning techniques applied to historical data?

Key Steps:

- Identify specific needs and challenges in forecasting solar energy production.

- Analyze recent research and methodologies for time series forecasting in the energy sector.
- Develop and test strategies to enhance the model's performance.
- Design user-friendly data entry and forecast visualization.

5. Methods and Workflow

a. Methodology and Workflow

The methodology for this project is provided by time series forecasting and machine learning. The workflow contains data collection, preprocessing, model selection, training, evaluation, and forecasting.

b. Datasets and Data Sources

The primary dataset for this project includes historical solar energy production data from various countries, measured in terawatt-hours (TWh). This dataset, provided by ourworldindata.org, includes data from several years and various countries, ensuring a comprehensive basis for model training and evaluation.

The source of this project is from https://ourworldindata.org/grapher/solar-energy-consumption

c. Modeling

Model development will be improved by time series forecasting models such as ARIMA (AutoRegressive Integrated Moving Average). The project will explore model tuning, and validation techniques to maximize forecasting accuracy.

d. Deliverables

The project aims to deliver to the users data input and forecast visualization. The final deliverables include a trained machine learning model for solar energy production forecasting.

6. Conclusion

This project implements machine learning, specifically the ARIMA model, to forecast solar energy production for various countries. By accurately predicting future trends, the project aims to enhance energy planning, sustainability efforts, and decision-making in the renewable energy sector. The detailed workflow, from data preprocessing to model evaluation, provides a reliable predictive tool that contributes to global sustainability goals.

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