機械学習を用いた太陽光エネルギーの出力を予測する説明的研究アプローチに関する研究

Form 3

Abstract

Title: An Explanatory Study Approach, Using Machine Learning to Forecast Solar Energy Outcome

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Artificial intelligence (AI) techniques play a crucially important role in predicting the expected energy outcome and its performance, analysis, modeling and control of renewable energy.

Solar energy usage has grown exponentially over the years. In the face of global energy consumption and increased depletion of most fossil fuel, the world is faced with the challenges of meeting the ever-increasing energy demands, also utility companies who provide solar energy have a challenge of unstable input of solar energy to the grid due to its intermittent nature, unlike other sources, hence the difference between expected generation and actual generation, demand and supply can lead to an unbalanced grid. Therefore, incorporating accurately machine learning technology to predict the expected outcome of solar energy from the intermittent solar radiation will be crucial to keep a balance grid operation between supply and demand, production planning and energy management especially during installations of a photo-voltaic power plant.

However, one of the major problems of forecasting is the algorithms used to control, model, and predict performances of the energy systems which are complicated and involves large computer power, differential equations, and time series. Also having unreliable data (poor quality) for solar radiation over a geographical location as well as insufficient long series can be a bottleneck to actualization. To overcome these problems, we employ the anaconda Navigator (Jupyter Notebook) for machine learning which can combine large amounts of data with fast, iterative processing and intelligent algorithms allowing the software to learn automatically from patterns or features to predict the performance and outcome of Solar Energy which in turns enables the balance between supply and demand on loads, efficient operation of the utility company as well as enhances power production planning and management.

Firstly, the thesis describes the need for alternative source of energy generation in developing countries, next, it focuses on forecasting the output power of solar systems is required for the good operation of the power grid or for the optimal management of the energy fluxes occurring into the solar system. Finally, the proposed methods is being summarized. Scopes of future research have also been described.

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