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A Real-Time Machine Learning Based Statistical Approach for Power Generation Prediction for Solar PV Plant

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Abstract. It is crucial to strive towards adopting more eco-friendly methods in response to technological progress. Our primary objective is to acquire further knowledge regarding the process by which solar panels produce electricity and to motivate future generations to utilize non-renewable resources with utmost frugality. Predicting power generation for solar PV panels is challenging due to the influence of various changing elements such as fog, mist, pollution, sudden cloud cover, and the presence of flies. These factors, in addition to irradiance, contribute to the complexity of the prediction process. Therefore, performing an analytical calculation of irradiance for a specific location (geographical position) and day number does not yield the appropriate power outputs from solar panels. Therefore, machine learning techniques are employed to address this nonlinear parametric problem, while considering different limitations, such as varying test-train ratios and data quantities. In this work, we have utilized an analysis that relies on the outcomes of five machine learning estimators, namely random forest, decision tree, support vector machine, naive Bayes, and logistic regression.

Keywords: Power System · Solar Energy · Machine Learning · Weather Forecasting · Time Series Analysis

1 Introduction

It is widely acknowledged that growing power consumption is depleting natural resources. This is increasing environmental pollution and global climate change. Renewable energy provides many advantages over conventional sources, including low environmental effect, making it necessary to switch. Solar energy is

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