The MJO diversity in CMIP6 models

Yelim Kim1, Seok-Woo Son1

1School of Earth and Environmental Sciences, Seoul National University, Seoul, Republic of Korea

The capacity to accurately forecast solar power generation provides crucial insights for enhancing cost efficiency in electricity supply and demand. Furthermore, it plays a pivotal role in decision-making for the installation or expansion of solar power facilities in the future. While recent studies have demonstrated predictions using Deep Neural Networks (DNN) or Recurrent Neural Networks (RNN), these methods often fall short in regions like South Korea, where there are distinct four seasons and precipitation events constitute only about 10% of the annual data. To better simulate such climatic conditions and cater to the nuances of this region, this study embarks on the development and analysis of three gradient boosting machine learning-based methods for predicting solar power generation. Leveraging data from the Yeongam solar power plant in Korea and meteorological observation stations, we employ existing linear features and juxtapose the predictive outcomes of these algorithms. The culmination of our research is the design of an optimized solar power prediction algorithm, versatile enough for various categorical datasets. These models, enriched by a plethora of meteorological features, offer benefits such as high accuracy and swift learning times. Our findings pave the way for potential studies assessing whether solar power generation across the Korean Peninsula is on a decline or an upswing.

Key words:

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In the rapidly evolving landscape of renewable energy, the ability to accurately forecast solar power generation is emerging as a linchpin for strategic decision-making. This capability is not just about meeting the immediate electricity demands efficiently; it is also a cornerstone for long-term planning, especially when considering the installation or expansion of solar power infrastructures. While there have been significant strides in harnessing the predictive power of Deep Neural Networks (DNN) and Recurrent Neural Networks (RNN) in this domain, challenges persist. Particularly in regions like South Korea, which boasts a unique climatic backdrop characterized by distinct four seasons, standard prediction models may not always suffice. The infrequency of precipitation events, accounting for a mere 10% of the annual weather data, further complicates the forecasting scenario. Recognizing these intricacies, our study delves deep into the development and exhaustive analysis of three advanced gradient boosting machine learning-based methods tailored for the Korean context. Our methodology is rooted in the rich datasets from the Yeongam solar power plant and numerous meteorological observation stations scattered across the region. By juxtaposing the predictive outcomes of these novel algorithms against benchmarks set by existing linear features, we aim to shed light on their relative efficacies and potential areas of improvement. A significant highlight of our research is the formulation of an optimized solar power prediction algorithm. Its versatility is evident from its applicability across a wide array of categorical datasets, making it a robust tool for diverse forecasting needs. These newly developed models, which are deeply imbued with a multitude of meteorological nuances, stand out for their commendable accuracy and impressively swift learning trajectories. Our findings not only offer a fresh perspective on solar power forecasting in South Korea but also set the stage for subsequent studies. These could delve into broader questions like the trajectory of solar power generation across the entire Korean Peninsula—whether it is poised for growth or facing potential decline.

"Enhanced Solar Power Forecasting in South Korea: An Exploration of Gradient Boosting Machine Learning Techniques"

"Harnessing Gradient Boosting for Accurate Solar Power Predictions: A Case Study from Yeongam, South Korea"

"Bridging Meteorological Nuances with Machine Learning: An Optimized Approach to Solar Power Forecasting in Korea"

"Redefining Solar Power Predictions in Korea: A Deep Dive into Gradient Boosting Algorithms"

"From Yeongam to the Korean Peninsula: Advancing Solar Power Forecasting with Gradient Boosting Machine Learning"