

Forecasting of wind and solar production at specific locations

Keywords: Forecasting, Renewable Energy

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Project description

Renewable energy forecasting is a key tool in energy markets, as it allows bids to be submitted based on the expected production at a solar farm or wind park. They are also useful to grid operators, as they can help them plan their operations to improve power quality. Over large geographic areas, the production of renewables can average out. However, an individual renewable energy producer will be subject to local weather conditions, such as cloud cover and wind speed, which will impact their power output. Other, sometimes invisible, factors can also influence their power output, such as the maintenance of units within the farm/park, curtailment of resources, and downstream deficits for wind farms.

A competition, in part sponsored by Rebase Energy, was thus previously launched on the IEEE dataport. There participants were asked to predict the solar and wind production of a hybrid power plant consisting of the Hornsea 1 wind farm as well as the combined solar capacity of East England. By constraining your search to this area, you are tasked with forming probabilistic predictions at the 10, 20, 30, 40, 50, 60, 70, 80, and 90% quantiles. Data will cover the period 2020-09-20 to 2023-10-27. Through careful division of this data, inclusion of covariates, and model selection, you are tasked with building your very own forecaster, one that can rival existing models.

Objective:

Deliver a forecast and compare your results to the competition entries, can you beat the existing forecasts?

References:

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H. Panamtash, S. Mahdavi and Q. Zhou, "Probabilistic Solar Power Forecasting: A Review and Comparison," 2020 52nd North American Power Symposium (NAPS), Tempe, AZ, USA, 2021, pp. 1-6, doi: 10.1109/NAPS50074.2021.9449746. Available:

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Slides from previous winners: [https://iee-](https://iee-dataport.s3.amazonaws.com/docs/36398/HEFTcom%20at%20ISFConf24.pdf?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAJOHYI4KJCE6Q7MIQ%2F20250312%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20250312T083650Z&X-Amz-SignedHeaders=Host&X-Amz-Expires=86400&X-Amz-Signature=82e632e535513d7f69136609bdc94e385d561389a44ba5209d13adf32f7f8c4b)

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Useful data-sets: Data for the project is available on the IEEE DataPort: <https://iee-dataport.org/competitions/hybrid-energy-forecasting-and-trading-competition>