

Machine Learning Methods for Solar and Wind Forecasting



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This book develops a time-causal evaluation of short-horizon renewable-power forecasting using measured PVDAQ and SDWPF records. Nineteen experiment jobs evaluate 10-, 30-, and 60-minute forecasts, delayed measured inputs, physical and statistical baselines, Ridge regression, histogram gradient boosting, a feature ablation, and quantile intervals. Solar models are selected in 2020 and tested across 2021. An incompatible 2020 wind timestamp grid prevents the original cross-year wind design; a frozen amendment trains and selects within early 2021 and tests November-December at three turbines. Boosting improves solar MAE relative to ordinary persistence by 21.8%-44.2%, but clear-sky persistence has lower point MAE at 10 and 30 minutes. For wind, persistence has lower MAE than every tested learned model in all nine main combinations, while learned models reduce RMSE and errors during large realized changes. Nominal intervals are imperfectly calibrated, and increasing the assumed input delay worsens all focal forecasts. Every conclusion is conditional on the observed eligible records, one PV system, one wind farm, unresolved native interval-label conventions, and nonuniform missingness. Timestamped predictions and 102 independently recalculated primary score rows support reproducibility. The results favor strong baselines, explicit information contracts, and loss-aware interpretation over generic claims of machine-learning superiority.

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