Combining AI tools can help improve forecasting at wind farms – study

Combining different artificial intelligence (AI) tools to take into account a variety of short-and long-term forecasting data sets from wind farms can help improve wind production forecasting, according to a new academic study published in the Applied Energy journal.

by Orlando Jenkinson 13 February 2025

AI computing is reliant on calculations performed by powerful computers (pic credit: quantic69 via Getty Images)

The study – carried out by academics from Aalborg University, Hong Kong Polytechnic University, China Agricultural University and the Ecole Polytechnique Fédérale de Lausanne – examines the use of "explainable" AI forecasting tools used at wind farms.

It shows that combining both short-term and long-term forecasting methods is likely to offer the best outcome for stakeholders, including wind farm owners and grid operators, looking to

improve forecasting.

Forecasting is of vital importance to wind farm operators and grid authorities alike, and AI has previously been touted as a way of improving forecasts at wind farms and tackling the persistent problem of overestimating their output.

Yet getting the best use of this new tool will require its own methodology.

“We need to have as good a forecast as possible, so we have checked different forecast methods, to find one which is predicting the wind power production as well as possible. This is rather difficult, since the wind is changing all the time, both from day to day and from minute to minute. So using both long-term and short-term prediction methods is important,” co-author Birgitte Bak-Jensen, professor in intelligent control of the electrical distribution systems at Denmark’s Aalborg University, told Windpower Monthly.

Better forecasting

Four explainable AI techniques used in forecasting are evaluated in the study, each with its own advantages for integrating AI in wind farm forecasting.

For example, ‘Shapley additive explanations’, or ‘SHAP’, calculates the importance of each feature to an overall data set, while ‘partial dependence plots’ describe how variables can impact predictions.

The study shows that different techniques offer different advantages for interpreting AI data from wind farms, meaning that using multiple techniques could help operators get the most accurate results for forecasting.

Bak-Jensen described the potential for the wind industry of the findings: “If you have a good prediction of wind power production, then you will also be more able to set your consumption according to the actual production. In future the customers will be active consumers, trying to use their energy at lowest cost, and with a good prediction and forecast, this will be more accurate to predict when the prices are low.”

“Further, a correct prediction will also help to be able to size possible energy storage better,” she added. “Better forecasts will of course give better estimation of production, so this would lead to less overestimation.”

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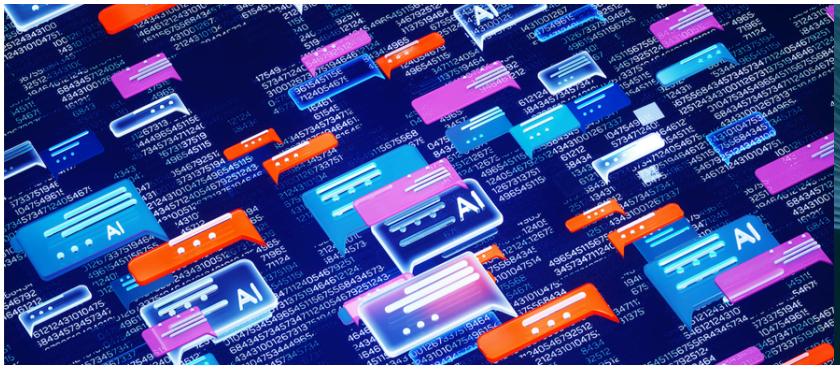

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