Online Regime Switching Vector Autoregression Incorporating Spatio-temporal Aspects for Short Term Wind Power Forecasting

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Motivation

As power systems integrate increasing amounts of wind power, the operation of the power system needs to be more flexible to compensate for increased variability.

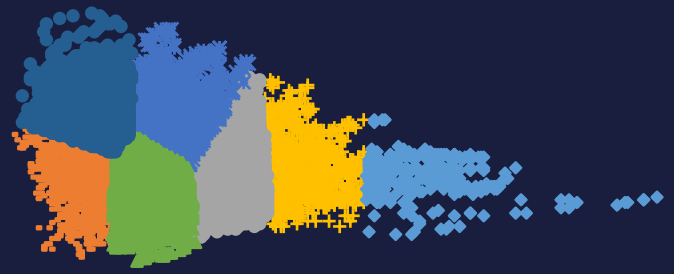
The total variability can be separated into two components, the variability of the wind resource itself, and the variability of the wind power forecast error.

Electricity system participants with wind power in their respective power systems use wind power forecasts for their operations, trading, and planning.

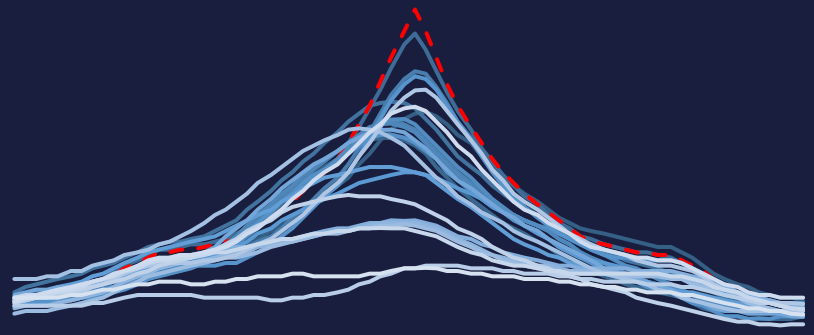
The integration of a significant amount of wind power will ultimately depend on the accuracy of wind power forecasts.

Novel Forecasting Model Development

Characterized meteorological conditions with regimes based on clustering algorithms.



Captured propagation of conditions through space and time for each regime using vector autoregression.

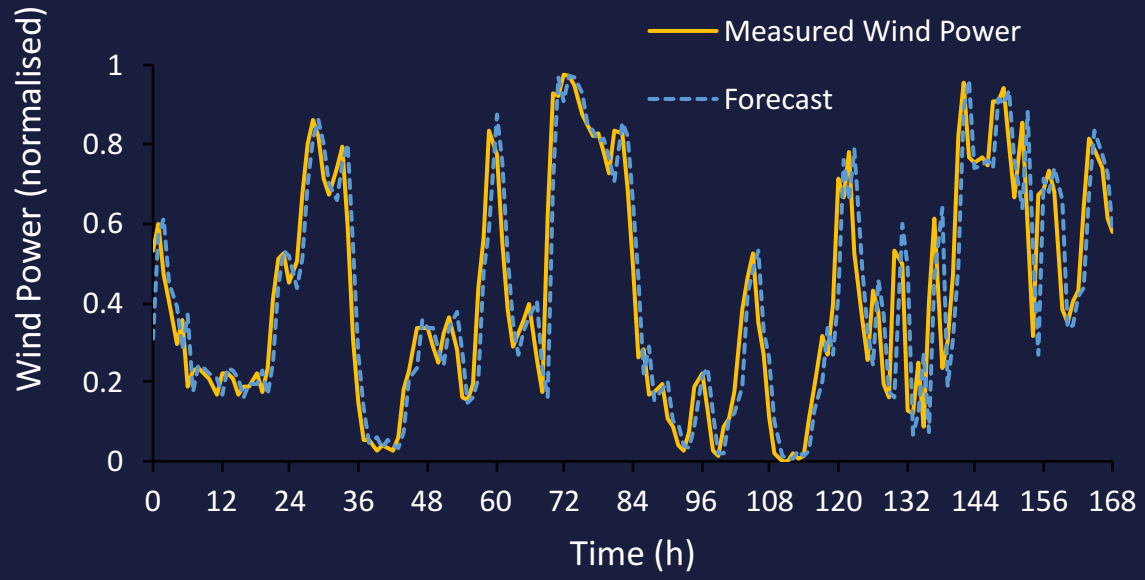


Coded and implemented the models into Vitec's Aiolos forecast studio, a software as a service .NET application used by transmission system operators, balance responsible parties, and energy companies across Europe.

Case Study

Tested models using data from Numerical Weather Prediction models and from 24 Wind Farms (329 MW)

Models fit using 2015 data. Generated and evaluated 12.1 billion point forecasts from models for 2016.



How has this work contributed to solve a problem related to energy?