

COMPANY

Iberdrola

RESEARCH CENTRE

Basque Center for Applied Mathematics

PRODUCTIVE SECTOR

Energy and environment

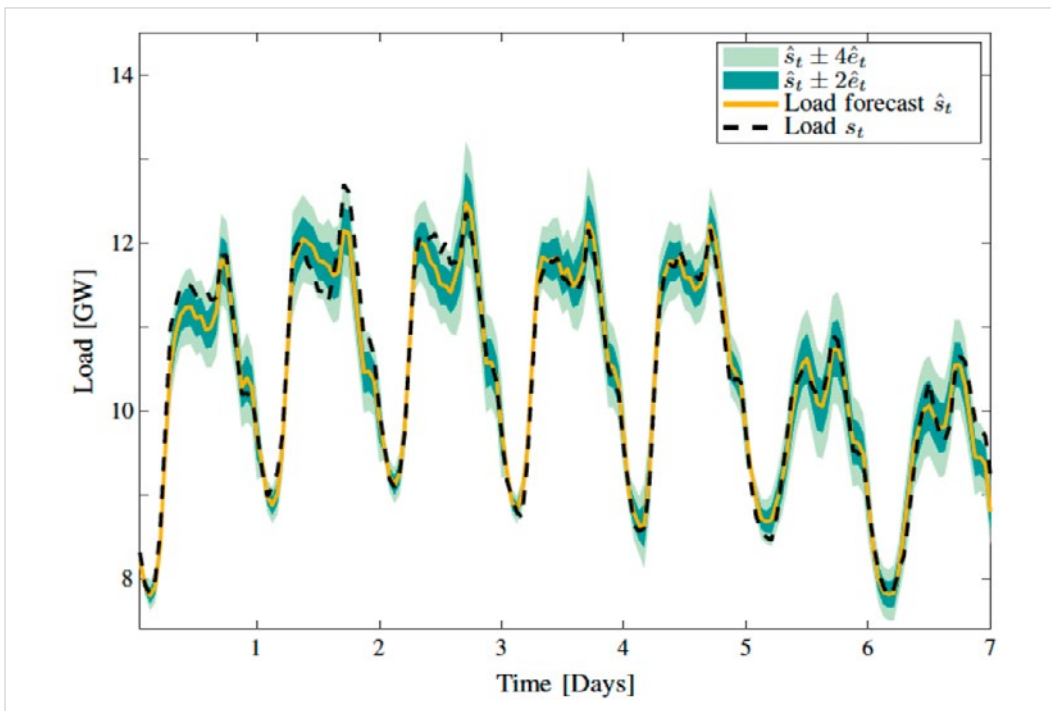


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SS_043_2023

AI4EP

Machine learning for energy forecasting.
Supervised learning solutions for energy-related forecasting problems.



The proposed methods obtain forecasts together with reliable uncertainty assessments.

PROBLEM DESCRIPTION

Load and energy price forecasting is crucial for multiple energy management tasks such as scheduling generation capacity, planning supply and demand, and minimizing energy trade costs.

CHALLENGES AND GOALS

Coping with the challenges arising from the dynamic changes in consumption patterns (concept drift) and intrinsic uncertainty in load demand and financial energy related variables.

MATHEMATICAL AND COMPUTATIONAL METHODS

We propose methods for load and price forecasting that can assess uncertainties in load demand and price and adapt to changes in consumption and cost patterns.

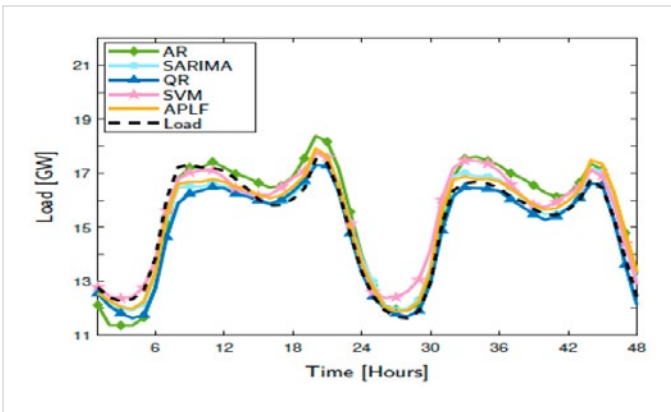
We develop algorithms that obtain predictions using hundreds of models updated with the most recent real data.

We develop energy price forecasting techniques that obtain predictions using a long short term memory (neural network) (daily retrained with the most recent data).

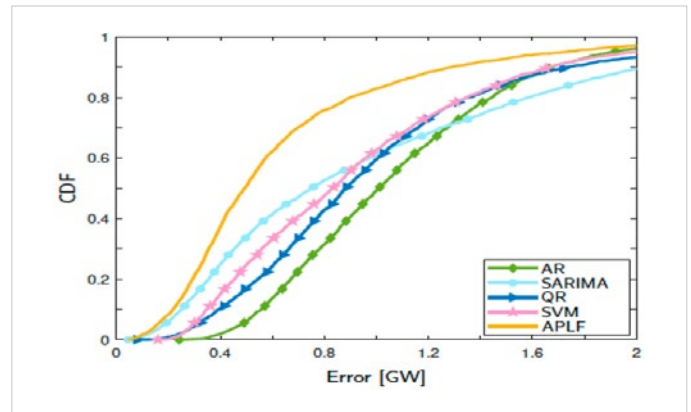
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Load demand in New England.



CDFs of prediction error.

RESULTS AND BENEFITS

The proposed APLF methods can assess energy-related variable uncertainties and adapt to changes in variable patterns. The numerical results show that the proposed methods can significantly improve forecasting performance in a wide range of scenarios using efficient and flexible algorithms for adaptive online learning. This achievement is further fortified by a collaborative partnership with IBERDROLA under the IA4TES project. The combined efforts with IBERDROLA's finance department have significantly help to delineate the main research objectives and methodological approaches.

Works published in high impact journals “Probabilistic Load Forecasting Based on Adaptive Online Learning” in IEEE Transactions on Power Systems, 2021.

Best applied contribution in the Statistical Field awarded by SEIO-BBVA Foundation, 2022.

Appearance in national media (e.g., Antena 3) and RMSE newsletter.