Load forecasting with covariates

Keywords: Forecasting, Machine Learning, Renewables, Covariates

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Project description
In order to ensure secure operations, such as maintaining a stable frequency and preventing voltage collapse, transmission system operators (TSOs) need to be able to accurately plan their operations. An integral part of planning is performing various forecasts of, for example, load and renewable generation, which lets the TSOs procure adequate reserves for the operating period.

Traditionally, such forecasts would be made using statistical tools. However, these have several limitations, such as not being able to make use of covariates like temperature, weather or information about holidays and large events. Traditional machine learning algorithms, such as gradient boosted trees or support vector machines are good alternatives to classical algorithms, as they are interpretable, easy to train and interpret and can make efficient use of covariates.

Your task in this project is to test the performance of a couple of such algorithms, that you will choose yourselves, when including different covariates and external data. The most basic of these covariates are the ones mentioned, temperature and holidays, but using others is encouraged.

Objective:
Forecast of electric load considering several covariates, including but not limited to weather and holidays.

References:
Jupyter Notebook tutorials on load forecasting authored by Prof. Hussain Kazmi of KU Leuven will be provided.

Book on load forecasting (available through KTH Library):
S. Haben, M. Voss, and W. Holderbaum, Core Concepts and Methods in Load Forecasting: With Applications in Distribution Networks. Cham, Switzerland: Springer Nature, 2023.

Overview of Load Forecasting Methods:
H. Hahn, S. Meyer-Nieberg, and S. Pickl, “Electric load forecasting methods: Tools for decision making,”

Useful data-sets:
Entso-e has extensive data on electric load, including their own forecasts, which can be found on the Transparency Platform. SMHI has weather data for all of Sweden, including e.g. temperature.