Exploring climate data's relevance to predict Energy consumption

SPDS800: Master's thesis in Data Science

Mathias Østergaard Hansen

February 1, 2022

1 Context

Energinet would like to be able to predict the normalized electricity consumption in Denmark. Energinet needs to be able to plan ahead in order to secure stable electricity coverage in the whole country. This means both in a large scale and in smaller scales as well. In Denmark 82.8% of the household energy consumption is used for heat[1]. This causes energy peaks with low temperatures when homes need a lot of energy to keep warm and lows on warm temperatures. The more Energinet knows about the forthcoming electricity consumption, the better they can plan ahead for possible peaks and lows. Energinet wishes to be able to make predictions for electricity consumption based on weather forecasts. For Energinet it is both interesting in a large scale and in smaller scale. This project will initially focus on forecasting for a large scale, which will be the two energy zones, DK1 and DK2. If time permits it, the model will be applied to make forecasts for energy companies, which is a much smaller scale.

2 Analysis

The goal for this project is to explore and analyse data from Energinet and the danish meteorologic institute, DMI, to try and uncover correlations between energy consumption and weather. This data is publicly available and cleaned before being published. The data will be analysed both separately

and in relation to each other. Weather forecast data is available trough Energinet database. This will also be analysed, and put into perspective in relation to historical observed data, before being used for prediction.
Predicting energy consumption is done already, therefore a literature review of already existing methods will be done. The literature review should give perspective and an overview of state of the art methods for time series regressional prediction in the fields of machine learning and neural networks.

3 Goals

During the project we will carry out the following tasks:

- Thorough data analysis and visualization of available data from Energinet and DMI.
- Reviewing and exploring predictions models and methods through a literature review.
- Data preparation and normalization done for
- Constructing a predictor that will predict electrical consumption in an hourly timescale, Specifically on a large scale implementation.
- Collecting results generated by the developed model and analyzing them.
- The predictor will be compared to a less complex naive model.
- If possible the model should be applied to a smaller scale.
- Commenting the results of the analysis and draw conclusions.

4 Agreement

The software implemented within this project will be made publicly available via `https://git.imada.sdu.dk` under MIT license (`https://opensource.org/licenses/MIT`).

References

[1] Energistyrelsen. *Energistatistik 2019* Energistyrelsen, 2020