École Polytechnique Fédérale de Lausanne
Distributed Electrical Systems Laboratory
EPFL-STI-DESL-ELL, Station 11, CH-1015 Lausanne

http://desl-pwrs.epfl.ch

Student project proposal

Project title
Including categorical variables in probabilistic load forecasting using empirical copulas

Project type ☒ MSc thesis ☐ BA semester project ☒ MSc semester project

Project responsible and e-mail
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Project description

Accurate load forecasting is essential for the efficient management and operation of power systems. This project aims to enhance probabilistic load forecasting by integrating categorical variables such as socio-demographic information, holidays, and consumer behavior patterns. Using empirical copulas, which are effective in capturing dependencies between variables, the project seeks to improve the accuracy and reliability of load forecasts.

Tasks of the student
Model Development:

- Perform literature review on methods using categorical variables in empirical copulas
- Propose a methodology for load forecasting including categorical/discrete variables.

Implementation and Evaluation:

- Implement the forecasting model using programming languages such as Python or Julia and assess its performance

Requirements
Statistical and Analytical Skills:

- Understanding of statistical methods and concepts, particularly empirical copulas.
- Proficiency in data analysis and statistical modelling.
- Knowledge of methods combining continuous and discrete/categorical variables is a bonus

Programming Proficiency:

- Experience with programming languages such as Python or Julia.
- Familiarity with relevant libraries for statistical and machine learning applications.

Interest in Energy Systems:

- Keen interest in energy systems, load forecasting, and the integration of diverse data sources to improve forecasting accuracy.

Literature

[1] Austnes, P. F., García-Pareja, C., Nobile, F., & Paolone, M. (2023). Probabilistic load forecasting of distribution power systems based on empirical copulas. arXiv. https://arxiv.org/abs/2310.03657