

Department for Stochastic Simulation and Safety Research for Hydrosystems (LS³)

Project / B.Sc. Topic

In this project, we are investigating the impact of climate change on water demand in southern Germany by utilizing real-world data provided by regional water suppliers for the period between 2010 and 2020. Recent advancements in artificial intelligence and machine learning offer unprecedented potential for modelling complex, nonlinear relationships that are often beyond the scope of conventional statistical models. Currently, no established models exist to reliably predict future water consumption under varying climate conditions, making this a critical area of research.

Current research efforts have primarily focused on linear regression and Gaussian Process Regression (GPR) techniques. These models, however, treat data points as independent, neglecting potential temporal dependencies that may exist within the data. Research indicates that





incorporating lagged variables — where pastvalues influence current behaviour — can significantly enhance predictive accuracy. It remains an open question whether this time dependence is relevant across all variables or only specific ones. This thesis will investigate these temporal relationships and their impact on model performance, with the scope and focus of the project adaptable based on the student's interests, skill set, study program and type of thesis.

Prospective tasks

- Literature research on GPR models, lagged variables and time dependence
- Implementation of a time dependent model and training on real world data
- Performance evaluation by comparison to existing models

General Information

- Advisor: Philipp Hofmann
- Examiner: Prof. Dr.-Ing. Sergey Oladyshkin

Desirable Skills

- Solid understanding of mathematical and statistical concepts
- Experience with scientific programming in python
- Interest in application of machine learning to real world problems



Apply now!

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