



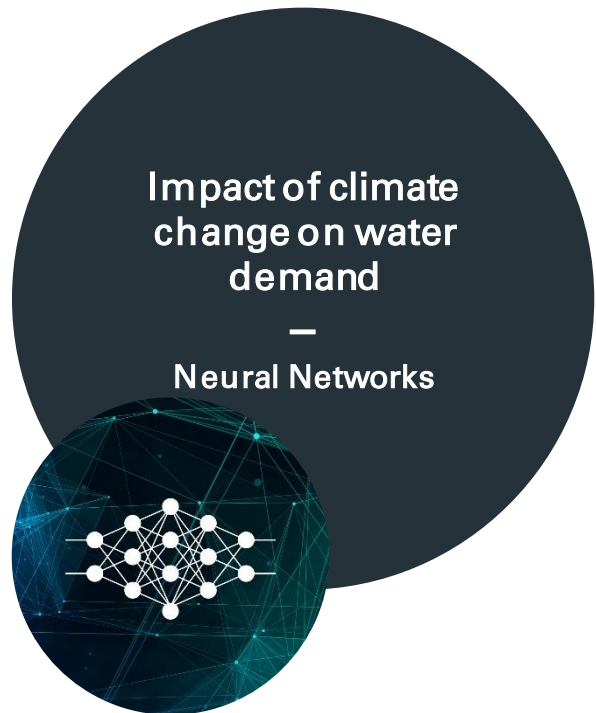
**University of Stuttgart**  
Germany

Department for Stochastic Simulation  
and Safety Research for Hydrosystems (LS<sup>3</sup>)

## Project / B.Sc. / M.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. Literature suggests that neural networks, particularly feedforward neural networks (FNN) and Long Short-Term Memory (LSTM) networks, have significant potential to capture the complex and nonlinear interactions inherent in such data. However, a key challenge in this context is the relatively small size of the available datasets. This thesis aims to address this challenge by investigating the suitability of feedforward neural networks and LSTMs for water demand prediction under data constraints. The specific scope and focus of the project can be tailored based on the student's interests, skill set study program and type of thesis.



## Prospective tasks

- Literature research on FNNs and LSTMs
- Implementation of architectural search algorithm(s) and model training and validation based on PyTorch implementations
- Evaluation of the model performance 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 programming in Python
- Interest in application of machine learning to regional, real world problems



**Apply now!**

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