The energy transition and the resulting expansion of renewable energy resources increasingly pose a challenge to the energy system due to their volatile and intermittent nature. In this context, energy management systems are central as they monitor and forecast energy flows. One way to automatically predict energy flows is reinforcement learning. Here, learning agents are trained on smart meter data and get rewarded for desired behaviors and punished for undesired ones. However, using smart meter data for load forecasting is challenging due to data privacy requirements. One solution to improve data privacy is federated learning, as data is kept private, and only the trained machine learning models are merged and updated on a global server. Your thesis analyzes how federated learning can improve data privacy and accuracy for load forecasting.

Your Thesis

- **Review**: You will review the state-of-the-art research on reinforcement learning, load forecasting, and federated learning. Here, you focus on algorithms and architecture.
- **Architecture concept**: Based on your research, you propose a federated learning architecture for secure load forecasting.
- **Implement**: You will implement your concept with a selected algorithm on real datasets.
- **Evaluate**: You will thoroughly evaluate the experiments.

Your Skills

- You study **Computer Science, engineering, industrial engineering, or a related course** of study
- You are deeply interested in topics such as **artificial intelligence, deep learning, energy systems, or load forecasting**
- You are able to **read and write scientific texts** in English or German
- You already have some experience in **Python**
- You show an above-average degree of **initiative and commitment**, as well as a thorough way of working

What we offer

- You get **exciting insights** into our research and gain valuable **practical experience**.
- We offer a flexible and **remote work environment**.
- **Regular and extensive support**: Weekly or bi-weekly 1:1 meetings to address your questions, review your progress, and discuss your strategy.
- We aim to **publish** high-quality work in an IEEE journal.

Application

- **Start**: Immediately
- **Contact**: At [jonas.sievers@kit.edu](mailto:jonas.sievers@kit.edu) with your CV, grades, and a few sentences about why you are interested. No cover letter necessary 😊
- **Questions?** For questions, you can reach me at 01573 2470 449