



Institute for Automation and
Applied Informatics (IAI)

**Earliest start:
now**

Bachelor-/Master thesis

Data-driven rule-based control of a heat pump system to provide grid services

Keywords: control, optimization, modeling

A high share of renewable energy in the grid requires measures to manage the fluctuations in power generation. One possible measure is to shift electricity demand to times of high generation. As buildings consume 40% of the final energy in the EU, they offer a large potential to shift their energy demand to counteract the intermittent renewable energy generation.

A widely used method to exploit the energy flexibility of buildings is Model Predictive Control, an optimization technique that requires extensive modeling efforts. The goal of this thesis is to use machine learning techniques to emulate the behavior of a model predictive controller to achieve good control performance without extensive modeling efforts.

We are looking for a dedicated and motivated bachelor or master student. The tasks include running simulations with an existing model predictive controller to obtain data and identify the relevant features that determine the controller's decision making. Subsequently, a simple controller should be developed using these features. The exact topic can be customized. The thesis can be written in English or German.

Tasks:

- Literature research on the current state of the art
- Carrying out simulations to obtain relevant data
- Extracting of the relevant features
- Developing a simple controller using the extracted features
- Evaluation of the developed controller

Education, experience and skills:

- Field of study: mechanical engineering, mechatronics, computer science, electrical engineering (or similar)
- Knowledge of Matlab and/or Python
- Experience in machine learning (especially in regression and time series analysis)
- High motivation and ability to work independently

For further information please contact:

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