

# AI-Based Methods for Improving Scalability and Adaptability of Intelligent Control Algorithms in Smart Buildings

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## Summary

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*The research will be conducted in the framework of the research project “Data-driven assessment of the potential and impact of energy saving flexibility technologies in buildings” in cooperation with the company R8 Technologies (<https://r8tech.io>).*

Research field:	Information and communication technology
Supervisors:	Prof. Dr. Eduard Petlenkov Ahmet Köse
Availability:	This position is available.
Offered by:	School of Information Technologies Department of Computer Systems
Application deadline:	Applications are accepted between January 01, 2025 00:00 and January 24, 2025 23:59 (Europe/Zurich)

## Description

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The research will extend classical modeling approaches by incorporating emerging techniques such as fractional-order modeling and symbolic regression. By leveraging the FOMCON toolbox, novel fractional-order control schemes will be designed, analytically verified, and validated in laboratory settings. Through iterative refinement, these methods will be tailored for deployment in cyber-physical systems, distributed control systems (DCS), and internet-of-things (IoT) platforms, making them readily transferable to industrial contexts.

This work aims to bridge existing gaps between cutting-edge academic research and the practical needs of industry. By enabling more accurate system simulation, robust control, and improved adaptability in complex systems—ranging from manufacturing lines to HVAC installations—the enhanced FOMCON-based solutions will facilitate smarter automation strategies. Ultimately, the improved control architectures developed in this project will offer measurable benefits, including enhanced control loop performance, more efficient resource utilization, and the improvement of relevant key performance indicators in real-world industrial applications.

Requirements for the candidate's background and knowledge:

- Good knowledge of dynamic modelling and control theory;
- Good knowledge of Intelligent control algorithms and/or fractional order modelling and control;
- Good knowledge of numerical optimization methods;
- Excellent knowledge of MATLAB/Simulink;
- MSc in a related field;
- Outstanding master thesis in the field of control theory;
- At least one published paper in the field of the research in a journal with impact factor higher than 4 in which the candidate is the first author;
- Good knowledge of Computational Intelligence methods and learning algorithms is a benefit.



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