
PhD Position



Two PhD Positions in Advanced Control and Optimization for Turbo Compressor Driven Heat Pumps

The TurboHeat project, funded by the Swiss National Science Foundation, addresses the technical challenges associated with advancing heat pump technology through the integration of turbocompressors. The goal is to improve energy efficiency by 20-25% over existing heat pumps for heating, ventilation, and air conditioning (HVAC) systems and electric vehicle thermal management. This improvement hinges on addressing critical design and control issues at small scales, where dynamic operating conditions and manufacturing imperfections pose significant obstacles.

The project focuses on the development of advanced control strategies and robust optimization techniques to manage the fast, multi-time scale dynamics that characterize turbocompressor-driven heat pumps. The downsizing of turbocompressors introduces unique control challenges such as instabilities (e.g., compressor surge) and performance degradation due to operational uncertainties. We will develop novel control theory and computational tools to develop fast, reliable control algorithms and co-design methodologies that can optimize system performance under these challenging conditions.

Background The ideal candidate will have a background in control systems and / or optimization and an interest in developing both novel theory, as well as practical tools.

Our lab is composed of people with different nationalities and backgrounds and we encourage applicants from all locations, backgrounds and genders to apply.

Collaboration The two PhD positions offered here will contribute to the control and optimization aspects of this project, but will work in close collaboration with teams from the Laboratory for Applied Mechanical Design (LAMD) and the Scientific Computing and Uncertainty Quantification Lab (CSQI) at EPFL who will focus on modeling and design. A positive and collaborative attitude and ability to work with others in an interdisciplinary team is a necessity for this position.

Funding The successful candidate can expect the standard EPFL gross salary of 54'550CHF together with other benefits depending on civil status.

To Apply

1. Fill in the form provided by the doctoral program in *Robotics, Control, and Intelligent Systems*. Indicate your intention to apply to Prof. Colin Jones.
www.epfl.ch/education/phd
2. Email the completed application package directly to Prof. Jones indicating your interest in this project.

Deadlines

- Evaluation of candidates will begin in December, 2024
- Start-date: First half of 2025

Prof. Colin Jones

la.epfl.ch
colin.jones@epfl.ch

Laboratoire
d'Automatique

FNSNF
SWISS NATIONAL SCIENCE FOUNDATION

