

APPLICATION master thesis

Provisional working title:

Modeling workplaces in Human-Robot Collaboration: An Interdisciplinary Approach from Engineering, Social Sciences, and HCI

Initial situation / problem:

Task allocation in human-robot collaboration (HRC) determines which agent, human or robot, performs a task based on availability and capability. Optimizing this process enhances productivity. To apply optimization algorithms effectively, workplaces need to be modeled mathematically. This **includes representing factors such as task duration, human ergonomics, physical workload, and interaction dynamics in a structured, quantifiable way**. Such models enable systematic analysis and optimization of task allocation, efficiency, and human well-being.



The aim of the work:

The objective of this master's thesis is to explore various factors in human-robot collaborative workplaces and investigate how they can be effectively represented in mathematical or computational models. The student **will identify and model key factors** such as task time, ergonomics, and human preferences within a human-robot collaboration setting. These models will then be evaluated to assess their accuracy, relevance, and potential for supporting optimization algorithms

Main tasks:

- Conduct a literature review on human-robot collaboration (HRC) workplaces and relevant modeling approaches
- Analyze and identify key factors influencing HRC settings (e.g., task time, ergonomics, preferences)
- Model the selected factors within a human-robot collaboration scenario
- Evaluate the developed models for accuracy, usability, and potential in optimization contexts

Requirements

- **Familiarity with modeling techniques (e.g., mathematical modeling, simulation)**
- **Programming skills (preferably Python)**
- **Analytical thinking and interest in interdisciplinary work**

You can get more information in a personal conversation with the content supervisor.

First contact / support:

Univ.Prof. Dr.-Ing.
Sebastian Schlund
Email: sebastian.schlund@tuwien.ac.at

Content support:

MSc
Zahra Safari Dehnavi
Email: zahra.dehnavi@tuwien.ac.at