

Master Thesis Projects

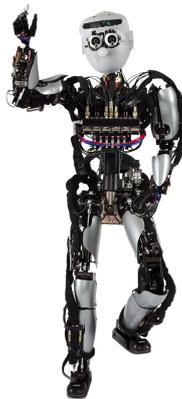
Learning Control

Machine learning for advanced control of autonomous robots

The ability to learn will be a key requirement for future robotic systems, which are envisioned to act autonomously in complex and changing environments. A core research area at the Autonomous Motion Department (AMD) is learning for control. We seek to combine techniques from machine learning, control theory, and optimization to develop intelligent control algorithms for the next generation of autonomous robots. In particular, we focus on the special requirements that real-time control systems pose for learning algorithms, such as guarantees for stability, robustness, and efficient computation.

While rigorous theory and mathematical analysis form the basis of our research, we validate our methods in experiments on physical robots. We have a number of state-of-the-art robotic platforms at AMD to study various aspects of autonomous robots (see photos below for some examples).

We are continuously looking for outstanding students who are eager to do their Master thesis on a challenging research project in a highly dynamic research environment. We have a variety of possible projects available, ranging from very theoretical to practical, and covering different aspects of learning control and robotics. Examples of possible topics include optimal control of movement, adaptive and learning control for complex robots, Gaussian process optimization for self-tuning control, learning to manipulate objects, and data-efficient learning of dynamic models.



[Photos: Wolfram Scheible (left/right), Luke Fisher (middle)]

Autonomous Motion Department (<http://www-amd.is.tuebingen.mpg.de>)

The AMD is headed by Prof. Stefan Schaal and part of the Max Planck Institute for Intelligent Systems (MPI-IS) located in Tübingen, Germany (near Stuttgart). The MPI-IS and ETH Zurich have recently established a research cooperation on Learning Systems, under which this Master thesis project can be carried out. Accommodation at the institute's guest house may be available for the duration of the project, and travel to international conferences can be supported if the project leads to such publications.

Prerequisites

High motivation and excellent theoretical and/or technical skills. Programming experience (C/C++, Matlab). Background in control, machine learning, or robotics is a plus.

Contact

Do not hesitate to contact us if you are interested in doing your Master thesis at AMD. When applying for a project, please include your CV, current grade transcript, a short motivation statement (what project are you interested in and why?), and optionally other documentation helpful to evaluate your background. After initial screening, we will invite suitable candidates to visit our lab in Tübingen.

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