

Master Thesis – Quiet Quadruped Locomotion through Imitation Learning

Legged robots are increasingly deployed in human-centered environments, where acoustic noise becomes an important factor for acceptance and usability. This thesis investigates whether animal-inspired locomotion combined with imitation learning can be used to develop quieter walking patterns for quadruped robots.

Research Area and Background

This thesis is situated at the intersection of **robotics**, **legged locomotion**, and **machine learning**. It focuses on the use of **animal-inspired motion data and imitation learning** to develop quieter locomotion strategies for quadruped robots. The work combines trajectory generation and optimization with data-driven learning methods, with a particular focus on reducing foot touchdown velocity and impact-related noise. The research contributes to the broader field of **human-centered robotics**, where quiet and unobtrusive robot operation is becoming increasingly important.



Your Tasks and Research Challenges

- **Generate** robot-compatible locomotion trajectories
- **Optimize** the trajectories with respect to **foot touchdown velocity, impact, and acoustic performance**
- **Develop and train** an **imitation learning** approach to transfer the optimized locomotion patterns to a quadruped robot
- **Evaluate** the learned locomotion policy in simulation and, where possible, on a real robot
- **Compare** the learned animal-inspired locomotion with conventional locomotion policies in terms of **stability, robustness, touchdown velocity, and acoustic emissions**
- **Analyze** the trade-off between quieter locomotion and overall locomotion performance

What we offer at the Machine Intelligence and Robotics Lab!

- You'll get to learn a lot about our current research and gain some real hands-on experience
- We use the latest robotics hardware and newest ML libraries, as well tools like ISAAC Lab, ROS2, etc.
- We are a team of international, motivated robotics enthusiasts and would be happy to have you join us
- You will get encouraging support from your supervisor and honest feedback to improve your skills
- We offer flexible working hours and a great working environment in our MaiRo Lab

Type: Master's thesis

Date: As soon as possible

Supervisors: Prof. Dr. Arne Rönau, M. Sc. Katharina Kohl

Do you want to work on cutting edge robotics research?

Contact: Katharina Kohl, katharina.kohl@kit.edu

We look forward to receiving your application (incl. current grade transcript)!

