Dear RIGI Applicants,

**This document presents 18 projects offered for the Robotics Institute Germany Internships (RIGI) 2026 at the Max Planck Institute for Intelligent Systems (MPI-IS) Stuttgart.**
Please review them carefully and select **up to two projects** on the application portal, in order of your preference (your most preferred project first). You may apply for up to two research projects: one **required and one optional.**

You will also need to write a short motivation for each project you are applying to (**Motivation, 80 words**), as well as describe how your background matches the technical skills required for the project (**Requirements, 80 words**).

**Note on use of AI tools:** Applicants may use language tools or AI systems to improve clarity and grammar in their application materials, but the content and ideas must be their own. **The use of AI to generate or compose full application texts is not permitted.**

**Application process:** All applications must be submitted through the official RIGI application portal. **Please do not contact supervisors or mentors to promote your application or send applications by email**. Once you have completed your application through the portal, rest assured that it will be reviewed by the relevant project teams.

If you have questions about the program or the application process, reach out to the RIGI Coordination Team at rigi@is.mpg.de.

RIGI Coordination Team

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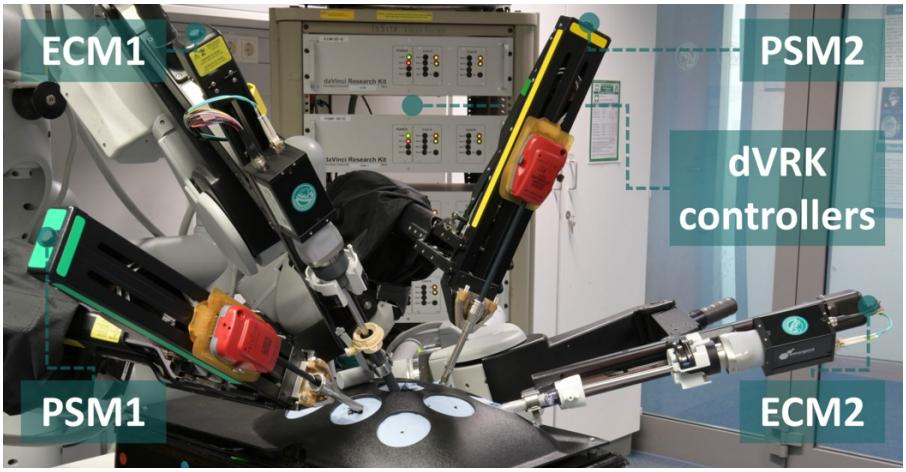
| **Department/Group/Facility** | Haptic Intelligence Department |
| **Main Supervisor** | Katherine J. Kuchenbecker |
| **Day-to-day Mentors** | Burak Aladag and Rachael L'Orsa |
| **Project Title** | Collaborative Multi-View Teleoperation of a Surgical Robot |
| **Research Areas** | Robotics, mechanical engineering, computer science |
| **Project Description** | One major research thrust of the Haptic Intelligence Department aims to improve robot-assisted minimally invasive surgery by developing novel technologies. We have recently proposed a new surgical paradigm that uses two independent stereo endoscopes (pairs of cameras) instead of one (Fig. 1). Having a second viewpoint available could improve a surgeon's situational awareness and facilitate faster, safer surgery.<br><br>  <br><br>Fig. 1. Our multi-view surgical robot (dVRK) featuring two standard instruments (PSM1, PSM2) and two camera manipulators (ECM1, ECM2).<br><br>As an intern, you will help your mentors integrate and test the two-camera teleoperation paradigm on our da Vinci Research Kit (dVRK). Specifically, you will develop software that allows multiple operators to view and control each camera and instrument independently. You will also help plan and run a study investigating the potential for multi-surgeon collaboration schemes using this two-camera approach. |
| **Required Technical Skills** | • Strong working knowledge of position and orientation in 3D, preferably including reference frame transformations.<br>• Programming skills in ROS1 or ROS2 and Python<br>• Data visualization skills |

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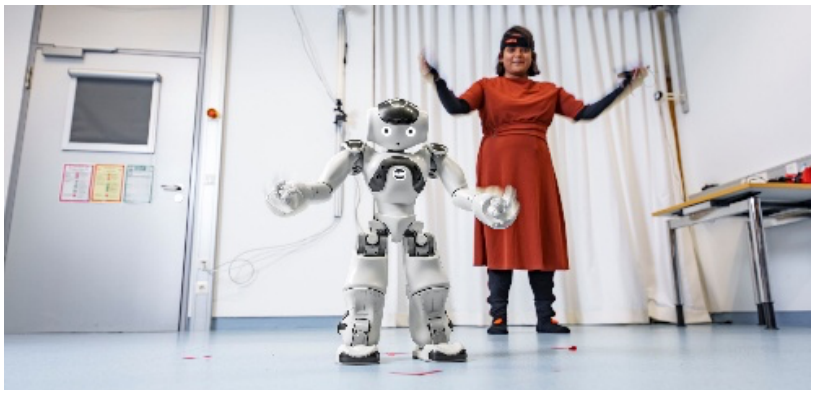
| **Department/Group/Facility** | Haptic Intelligence Department |
| **Main Supervisor** | Katherine J. Kuchenbecker |
| **Day-to-day Mentors** | Mayumi Mohan and Iris Andrussow |
| **Project Title** | Expressive Real-Time Teleoperation of Robotic Hands |
| **Research Areas** | Robotics, mechanical engineering, computer science, human-computer interaction |
| **Project Description** | The Haptic Intelligence Department investigates new ways of incorporating human movement, physical interaction, and touch cues into robotic systems and interfaces for human users. Recently, we created OCRA (Optimization-based Customizable Retargeting Algorithm) to quickly and accurately map the movements of one or two human arms to the movements of a wide range of robot arms to facilitate teleoperation (remote control), as shown for a NAO robot in the following image:<br>  <br>Inspired by OCRA, this project focuses on developing and evaluating a generalizable algorithm for real-time teleoperation of robotic **hands** with differing kinematic configurations (e.g., number of fingers, orientation of joints). The goal is to enable an operator wearing a motion-capture glove to intuitively control various robotic hands based on the ISyHand with high expressiveness and precision. As an intern you will work on algorithm design, implementation, and a small user study to assess performance during simple tasks. You will learn about human movement, hand kinematics, robot control, robot teleoperation, and user study design. |
| **Required Technical Skills** | • Basic understanding of robot kinematics and control.<br>• Hands-on experience with Python and/or C++.<br>• Experience with ROS 1 or ROS 2 would be helpful but is not required.<br>• Interest in robotic hands and/or teleoperation. |

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| **Department/Group/Facility** | Haptic Intelligence Department |
| **Main Supervisor** | Katherine J. Kuchenbecker |
| **Day-to-day Mentors** | Mayumi Mohan and Yijie Gong |
| **Project Title** | Haptic Feedback for Teleoperation of Robots with Prismatic Joints |
| **Research Areas** | Robotics, haptics, mechanical engineering, human-computer interaction |
| **Project Description** | The Haptic Intelligence Department investigates new ways of incorporating human movement, physical interaction, and touch cues into robotic systems and interfaces for human users. Recently, we created OCRA (Optimization-based Customizable Retargeting Algorithm) to quickly and accurately map the movements of one or two human arms to the movements of a wide range of robot arms to facilitate teleoperation (remote control), as shown for a NAO robot in the following image:<br> <br>This project aims to extend OCRA to allow teleoperation of robots with prismatic (linearly sliding) joints, which are commonly used to allow the arm length to vary over time. In addition to accommodating this new type of joint, a key component of the project will involve exploring how wearable haptic feedback can be used to make the operator aware of robot state limits, such as joint position, velocity, or torque boundaries. The intern will adapt our existing algorithm for the new architecture, explore haptic feedback approaches, and design a user study to evaluate the effectiveness of these cues in real-time teleoperation of a simulated or real robot with one or more prismatic joints. The intern will learn about robot control, human movement, haptic actuators, signal processing, and user study design. |
| **Required Technical Skills** | • Basic understanding of robot kinematics and control.<br>• Experience with ROS 1 or ROS 2.<br>• Knowledge of Python and/or C++.<br>• Interest in human-robot interaction and/or teleoperation. |

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| **Department/Group/Facility** | Haptic Intelligence Department |
| **Main Supervisor** | Katherine J. Kuchenbecker |
| **Day-to-day Mentors** | Bernard Javot, Giulia Ballardini |
| **Project Title** | Haptic Performance of the CAPT Motor |
| **Research Areas** | Haptics, mechanical engineering, electrical engineering |
| **Project Description** | The Haptic Intelligence Department explores human-machine interaction by combining electromechanical design, sensing, and haptic feedback to create realistic and responsive user interfaces. Recently, we invented and manufactured the CAPT (Continuous and Precise Torque) Motor, the first brushless ironless motor with a planar two-phase Lorentz-coil array and an axial-flux Halbach-magnet ring. It was designed to deliver excellent kinesthetic haptic feedback via a steering wheel mounted to its rotor (see image).<br>This project will investigate the fidelity of the haptic feedback that the CAPT Motor can deliver. The intern will contribute to the creation of software that links the motor's control interface with one or more virtual environments that allow the user to feel different haptic sensations. This system will enable the quantitative evaluation (via physical measurements) and/or qualitative evaluation (via subjective surveys) of the motor's haptic rendering fidelity. These findings will help characterize the motor's capabilities and provide insights into the suitability of the CAPT Motor design for haptic systems.<br>Through this internship, the student will gain hands-on experience with mechatronic integration, real-time control, haptic feedback, experiment design, and data analysis. |
| **Required Technical Skills** | • Programming experience (e.g., Python, MATLAB/Simulink)<br>• Basic knowledge of control systems (e.g., PD controller)<br>• Interest in haptics, VR, or human-machine interaction |

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| **Department/Group/Facility** | Haptic Intelligence Department |
| **Main Supervisor** | Katherine J. Kuchenbecker |
| **Day-to-day Mentors** | Uli Bartels and Rachael L'Orsa |
| **Project Title** | SuperCUTE Teleoperation |
| **Research Areas** | Robotics, haptics, data analysis |
| **Project Description** | In the Haptic Intelligence Department, we develop new technologies that expand robot teleoperation to include the sense of touch. We have recently built a new device that can provide cardinal directional cues to a wearer's wrist (Fig. 1), using four cutaneous electrohydraulic (CUTE) actuators.<br> <br><br>Fig. 1. Top: A user wearing our new haptic feedback device. Bottom: The device contains four independent CUTE actuators.<br><br>As an intern, you will help integrate our new wrist-worn haptic feedback device into a robot teleoperation platform. Together with your mentors, you will explore mappings between robot sensor data and haptic feedback delivered to the operator. You will then design, run, and analyze data from a user study to explore the effects of haptic feedback on the experience of a human who is remotely controlling a robot to perform various tasks. This work will involve mechatronic integration, programming, planning the user study, and conducting the user study. |
| **Required Technical Skills** | • Familiarity with sensors, actuators, and microcontrollers, ideally with hands-on experience<br>• Programming skills in MATLAB<br>• Data analysis and visualization skills |

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| **Department/Group/Facility** | Physical Intelligence Department |
| **Main Supervisor(s)** | Christoph Keplinger |
| **Day-to-day Mentor(s)** | Alp Can Karacakol, Ugur Bozüyük |
| **Project Title** | CELLnROLL |
| **Research Area(s)** | Mechanical engineering, electrical engineering, robotics |
| **Project Description** | In our project, we focus on developing advanced microrobotic systems that automate complex cellular analyses, particularly for immunophenotyping in hematological diseases. By combining robotics and microtechnology we aim to create cost-effective, high-throughput diagnostic solutions that reduce reliance on expensive optical components and specialized operators.<br><br>As an intern, you will actively contribute to prototype design and development, refining mechanical and electronic components for improved performance of the robotic system. You'll set up and run experiments to validate each design iteration, collecting and analyzing the resulting data. This internship offers a unique opportunity to gain hands-on engineering experience while applying advanced biomedical concepts |
| **Required Technical Skills** | Required technical skills<br>• CAD (e.g., SolidWorks): Ability to create and modify mechanical designs for prototype components.<br>• Basic Electronics & Prototyping: Understanding of electronic components, circuit assembly, and hands-on prototyping.<br>• Ability to collect, interpret, and document experimental data (e.g., using Excel, Python, or MATLAB).<br>• Programming & Scripting: Basic coding knowledge (e.g., Python, or C/C++) to support automation tasks, data processing, and control of prototype modules.<br><br>Bonus skills<br>• Computer Vision / Image Processing: Basic knowledge of OpenCV or similar tools for analyzing experimental data or supporting automated detection.<br>• Robotics & Automation: Exposure to kinematics, motion control, or robotic systems integration. |

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| **Department/Group/Facility** | Physical Intelligence Department |
| **Main Supervisor(s)** | Christoph Keplinger |
| **Day-to-day Mentor(s)** | Rut Martinez Miras |
| **Project Title** | Design and Fabrication of Programmable Magnetic Robots |
| **Research Area(s)** | Mechanical engineering, soft robotics |
| **Project Description** | In our lab, we focus on developing robots with intelligent capabilities encoded in their physical structure— a concept we call physical intelligence. We investigate the underlying principles of design, locomotion, and control of single and collectives of small-scale mobile robots made of multifunctional smart materials. Using bioinspired, biohybrid, and synthetic design strategies, we create soft and compliant robots with adaptive and versatile behaviors.<br><br>As an intern, you will explore innovative ways to design and fabricate magnetic robots, with the goal of making this technology more accessible and widely usable. You will learn about the key properties of magnetic materials, how to measure them, and tune them to achieve different functionalities. During this internship, you will get hands-on experience with various characterization and fabrication techniques, and have the opportunity to design and build your own prototypes. |
| **Required Technical Skills** | • Background in mechanical engineering, design engineering, materials science or a related field<br>• Experience with 2D and 3D CAD design<br>• Experience with laser cutting and/or 3D printing is a plus |

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| **Department/Group/Facility** | Physical Intelligence Department |
| **Main Supervisor(s)** | Christoph Keplinger |
| **Day-to-day Mentor(s)** | Izlen Erenoglu |
| **Project Title** | Investigation of biohybrid microrobot motility |
| **Research Area(s)** | Small scale medical robotics, biomedical engineering |
| **Project Description** | In our lab, we focus on developing soft and biohybrid robotic systems that integrate living cells with functional materials to enable controlled motion and localized therapeutic action in biomedical contexts. Our research combines materials science, bioengineering, and microscale robotics to advance next-generation approaches for targeted therapy.<br><br>As an intern, you will investigate the motility of so-called *immunobots,* engineered macrophages integrated with multifunctional magnetic particles. The project will include fabrication steps such as drop casting, chemical conjugation, and sputtering, followed by macrophage culture and the production of immunobots. You will then perform live-cell imaging in collagen matrices to study guided motion and analyze the resulting data using ImageJ and MATLAB. |
| **Required Technical Skills** | • Basic experience with mammalian cell culture and aseptic techniques<br>• Experience with ImageJ and MATLAB<br>• Knowledge of microscopy techniques, particularly fluorescence microscopy<br>• Interest and motivation to work at the interface of cell biology, materials science, and microscale robotics |

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| **Department/Group/Facility** | Robotic Materials Department |
| **Main Supervisor(s)** | Christoph Keplinger |
| **Day-to-day Mentor(s)** | Burebi Yiming |
| **Project Title** | Designing Stretchable Ionic Conductors for Soft Robotics |
| **Research Area(s)** | Materials science, soft matter |
| **Project Description** | **In our lab we focus on** current limitations of robotic hardware by creating new materials systems that serve as building blocks for intelligent robots that mimic the astonishing capabilities of organisms in nature.<br>As an intern, you will work on **stretchable ionic conductors**—soft polymer networks that combine elasticity with ionic conductivity. The project aims to understand how **polymer network architectures** influence the coupled mechanical and ionic transport properties of these materials. Through systematic synthesis and characterization, you will map trends linking toughness, elasticity, and conductivity, contributing to the design of next-generation materials for soft robotic applications.<br>You will be learning:<br>• Synthesis of polymer networks with varied architectures.<br>• Characterization of mechanical properties (tensile, fracture, viscoelastic response).<br>• Characterization of ionic transport (electrochemical impedance spectroscopy, dielectric measurements).<br>• Thermal analysis (DSC) to relate segmental dynamics to ion mobility. |
| **Required Technical Skills** | • Hands-on laboratory experience in chemistry, polymer science, or materials science.<br>• Basic understanding of polymer synthesis and characterization.<br>• Interest in soft materials, ionic transport, and structure–property relationships. |

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| **Department/Group/Facility** | Biomimetic Materials and Machines Group |
| **Main Supervisor(s)** | Florian Hartmann |
| **Day-to-day Mentor(s)** | Giulio Grasso |
| **Project Title** | Lightweight electrostatic actuators |
| **Research Area(s)** | Soft robotics, mechanical engineering |
| **Project Description** | Our research group focuses on the synthesis of mechanical design and sustainable material development with the aim of creating new bioinspired robotic systems. We are pursuing this through the study of new fabrication processes for soft materials, the formulation of biodegradable alternatives to plastics, and the design of untethered systems including actuation, sensing, energy storage and control. One of our research directions includes the development of lightweight, millimeter-scale electrostatic actuators based on metallized plastic foils, capable of generating mechanical work at a fraction of the weight and volume of conventional robotic actuators.<br><br>You will be able to design and fabricate soft robotic actuators based on metallized plastic foils. You will learn the functioning principle and governing equations of electrostatic actuators, and how to translate them into working systems. You will master how to generate complex structures from flat plastic films through mechanical and chemical processes. You will fabricate prototypes, characterize their electro-mechanical response, and develop small robots powered through your actuators. |
| **Required Technical Skills** | • Previous experience with CAD modelling software (Autodesk Fusion & AutoCAD, Solidworks) and fabrication processes for Soft Robotics (e.g., laser cutting, 3D printing, polymer-based casting).<br>• Mastery of Calculus and Geometry notions (i.e., differential equations, parametric representation of curves and surfaces).<br>• Good knowledge of coding languages (python, Wolfram Mathematica, MATLAB).<br>• Previous use of FEM software like COMSOL (optional). |

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| **Department/Group/Facility** | Cyborg Robotics and Intelligent Sensing Group |
| **Main Supervisor(s)** | Antonia Georgopoulou |
| **Day-to-day Mentor(s)** | Antonia Georgopoulou |
| **Project Title** | Sensor Development for Biohybrid Robotics |
| **Research Area(s)** | Materials science, soft robotics |
| **Project Description** | In our lab we focus on developing biohybrid systems that combine living cells with robotics, electronics, and smart materials. We use methods such as 3D bioprinting, microfabrication, and sensor material development to create organoid-on-a-chip platforms and biohybrid robots. By integrating biology with engineering, we aim to design systems that can sense, respond, and adapt for applications in health, diagnostics, and soft robotics.<br><br>As an intern, you will be working on the development and testing of sensor systems for biohybrid robotics, including material design, compatibility assessment, and integration with living tissues. The project focuses on developing and integrating sensors into living-tissue-based robotic platforms to enable real-time monitoring, feedback, and control. You will learn to apply methods such as biofabrication, sensor characterization, and data analysis while gaining hands-on experience in a multidisciplinary research environment at the interface of biology, electronics, and robotics. |
| **Required Technical Skills** | Required technical skills<br>• Background in materials science, electronics, or biomedical engineering<br>• Familiarity with sensors, electronic circuits, or 3D printing<br>• Interest in sensors, biohybrid robotics, or biofabrication<br>• Experience with laboratory techniques such as material characterization, microscopy, or cell culture (preferred but not mandatory) |

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| **Department/Group/Facility** | Embodied Social Interaction Group (ESI) and Organizational Leadership and Diversity (LD) Groups |
| **Main Supervisor(s)** | Philipp Müller (ESI), Ksenia Keplinger (LD) |
| **Day-to-day Mentor(s)** | Philipp Müller, Ksenia Keplinger |
| **Project Title** | The Body of Bias: Nonverbal Stereotype Contagion and Embodied Interventions in Human–Robot Interactions |
| **Research Area(s)** | human-robot interaction, human behavior |
| **Project Description** | Previous research in social psychology has shown that stereotypes can be transmitted via subtle nonverbal cues such as facial expressions. People observing biased nonverbal behaviour of others towards a certain group tend to be “infected” with this bias, a process which has been called “nonverbal stereotype contagion”. In this project, we will investigate the role robots can play in nonverbal bias contagion. Are robots able to spread bias via their nonverbal behaviour? Could robots even be used to disrupt nonverbal stereotype contagion between humans? By answering these questions, our project aims to foster more inclusive and self-aware human–robot and human–human interactions<br>This is a collaborative project between two independent research groups: the Embodied Social Interaction Group focuses on social interaction between humans and with machines and the Organizational Leadership & Diversity Group focuses on understanding human behavior and bias in technology-supported work contexts.<br>As an intern, you will support the development and testing of video stimuli featuring diverse robotic prototypes to examine how design and behavior influence human perceptions of nonverbal bias. This role offers hands-on experience at the intersection of robotics and behavioral science. |
| **Required Technical Skills** | • Experience with creating and editing video stimuli, including camera setup, recording, and basic post-production (e.g., Adobe Premiere, DaVinci Resolve, or similar).<br>• Skills in data analysis, in particular hypothesis testing with inferential statistics |

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| **Department/Group/Facility** | Embodied Social Interaction Group |
| **Main Supervisor(s)** | Philipp Müller |
| **Department/Group/Facility** | Embodied Social Interaction Group |
| **Day-to-day Mentor(s)** | Philipp Müller |
| **Project Title** | Personalised Multimodal Behaviour Analysis |
| **Research Area(s)** | Social Signal Processing, Data Analysis, Machine Learning |
| **Project Description** | In the Embodied Social Interaction Group we focus on social interaction involving humans and machines. We follow an interdisciplinary approach that integrates psychological and computer science perspectives. We are both interested in understanding human behaviour in the context of machines and in advancing the state of the art in automatic human behaviour analysis.<br><br>As an intern, you will be working on personalised multimodal behaviour analysis. Current approaches in human behaviour analysis tend to disregard inter-individual variation in the relation between behavioural channels and dependent variables. For example, to predict the engagement of a specific user, current approaches commonly use generic, user-independent models that map from behaviours (e.g. gaze, body movement, speech) to engagement values. You will contribute to research that (1) explores user-dependent variations in these mappings, and (2) seeks to develop automatic behaviour analysis approaches that are tailored to individual users. You will learn to precisely formulate a research question, operationalise it, conduct data analysis and ML experiments, and communicate the results. |
| **Required Technical Skills** | Required technical skills<br>• Experience with python (scientific computing and ML libraries)<br>• Knowledge of machine learning, computer vision, NLP |

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| **Department/Group/Facility** | Neuromechanics of Movement Group |
| **Main Supervisor(s)** | Janneke Schwaner |
| **Day-to-day Mentor(s)** | Janneke Schwaner; David Remy (Uni Stuttgart) |
| **Project Title** | Multiscale Hopping Machines: Where Biology Meets Robotics |
| **Research Area(s)** | Biomechanics, mechanical engineering, bioinspiration, robotics |
| | In the Neuromechanics of Movement group we focus on elucidating how animals (incl. humans) move seemingly effortlessly around in the complex world around us. A key area of our research explores the biomechanical and energetic role of tails in hopping animals – across scales, and how insights from nature can inform the design of agile, energy-efficient robots.<br><br>As an intern, you will contribute to ongoing research exploring how hopping animals and robots are able to be energy efficient and stable while locomoting over complex terrains, and how these capabilities scale with size (smallest mammalian hoppers are about ~40 grams, whereas the largest hoppers are ~25 kgs. Depending on your background and interests, you may work on the further development of computational models and/or physical robotic prototypes inspired by the kangaroo (rat) and other hopping species. |
| **Required Technical Skills** | Required technical skills<br>• Experience with coding in MATLAB<br>• Good knowledge of dynamical systems<br>• Basic understanding of control systems<br>• Interest in biology and bioinspiration |

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| **Department/Group/Facility** | Neuromechanics of Movement Group |
| **Main Supervisor(s)** | Janneke Schwaner |
| **Day-to-day Mentor(s)** | Janneke Schwaner; Philipp Rothemund (Uni Stuttgart) |
| **Project Title** | Tail Tech: From Kangaroo Rats to Soft Robotic Control |
| **Research Area(s)** | Biomechanics, mechanical engineering, soft robotics, bioinspiration |
| **Project Description** | In the Neuromechanics of Movement group we focus on elucidating how animals (incl. humans) move seemingly effortlessly around in the complex world around us. One aspect for our research focuses on understanding how our musculoskeletal system is controlled. For example, we use animal tails as model systems to better understand how inertial appendages, controlled by long tendons and relatively short tendons, control body posture and improve stability and maneuverability during locomotor tasks.<br><br>As an intern, you will be working on the further development of physical- and/or computational model of a tail, inspired on the biological model of the kangaroo rat. You will be learning to run and analyze computational simulations, interpret results, validate results with biological kinematics and kinetics data, design basic robotics parts, and communicate your findings to a cross-disciplinary audience. |
| **Required Technical Skills** | Required technical skills<br>• Experience with coding in MATLAB<br>• Good knowledge of dynamical systems<br>• Basic understanding of control systems<br>• Interest in biology and bioinspiration |

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| **Department/Group/Facility** | Organizational Leadership and Diversity (LD) and Robotic Composites and Compositions (ROCOCO) Groups |
| **Main Supervisor(s)** | Buse Aktaş (ROCOCO), Ksenia Keplinger (LD) |
| **Day-to-day Mentor(s)** | Ksenia Keplinger, Buse Aktaş, Felix Grüninger |
| **Project Title** | Responsive Desk Objects: Mechanical Biofeedback for Interoceptive Awareness |
| **Research Area(s)** | human-robot interaction, mechatronics, human behavior |
| **Project Description** | This is a collaborative project between two labs and a central scientific facility: the Organizational Leadership & Diversity Group focuses on understanding human behavior and interoception in technology-supported work contexts, the Robotic Composites and Compositions Group focuses on developing dynamic materials and structures for interactive robotic systems, and the Robotics Central Scientific Facility supports projects in all soft- and hardware-related aspects, from CAD to Electronics to 3D printing, and testing.<br><br>As an intern, you will be supporting the development and early testing of responsive desk objects (mouse pad, chair cushion, etc.) designed to foster interoceptive awareness. Working alongside a research assistant and the core project team, you will focus on testing prototypes with users, documenting usability, and assisting with the implementation of a pilot study. You will learn to develop, test, and troubleshoot mechatronic systems that incorporate biofeedback (e.g. heart rate) and conduct qualitative and quantitative usability tests with these systems. |
| **Required Technical Skills** | • Experience with mechatronic systems, incorporating actuators and sensors with a microcontroller<br>• Good knowledge of rapid prototyping and design<br>• Experience using CAD software for rapid prototyping<br>• Experience/interest in user studies, industrial design, and technologies that advance human well-being |

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| **Department/Group/Facility** | Medical Systems Central Scientific Facility |
| **Main Supervisor(s)** | Jelena Lazovic Zinnanti |
| **Day-to-day Mentor(s)** | Pouria Esmaeili-Dokht |
| **Project Title** | Magnetically actuated robotic platform for precise drug delivery |
| **Research Area(s)** | Medical imaging and robotics, bioengineering, chemistry, electrical engineering, computer science |
| **Project Description** | In ZWE Medical Systems we focus on developing robotically-assisted platforms that can be used for drug delivery or hyperthermia in combination with magnetic resonance imaging (MRI). In the past we have manufactured a magnetically actuated drug delivery capsule that can be navigated using magnetic field gradients during MRI. Once on desired location, this capsule can be remotely activated for on demand drug release. We are currently developing materials that can be heated using radio-frequency electromagnetic field to add hyperthermia functionality.<br>As an intern, you will be working on manufacturing different robotic capsules that can be controlled using magnetic field gradients and learning to navigate this capsule based on imaging feedback from MRI scanner. The intern will learn some basics of MR imaging as part of the daily routine, and there is an opportunity to learn how to use micro computed tomography (micro-CT) and X-ray devices. This project involves both programming (Python and Matlab) and hands on manufacturing of small robotics devices. |
| **Required Technical Skills** | • Background in mechanical engineering or bioengineering<br>• Experience with programming in Python and Matlab<br>• Experience with 3D drawing software<br>• Interest in biology and chemistry is a plus |

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| **Department/Group/Facility** | Medical Systems Central Scientific Facility |
| **Main Supervisor(s)** | Jelena Lazovic Zinnanti |
| **Day-to-day Mentor(s)** | Pouria Esmaeili-Dokht |
| **Project Title** | Towards low-field magnetic resonance imaging |
| **Research Area(s)** | electrical engineering, medical imaging and robotics, bioengineering, computer science |
| **Project Description** | One focus of ZWE Medical Systems is to design robotic systems that function harmoniously with various imaging modalities, specifically Magnetic Resonance Imaging (MRI) scanners. Currently, a novel magnetic sensing system has been developed for high-field MRIs (7 Tesla), capable of detecting the presence of miniaturised magnetic trackers (1 mm in diameter) within large volumes inside the scanner. To advance this concept, we aim to create a wireless magnetic sensing system that uses the same technology to operate at much lower magnetic fields, such as 500 mT.<br>As an intern on this project, you will learn to work with state-of-the-art controller systems, such as FPGA, high-frequency ADCs, DACs, and RF switches. The intern is expected to have a basic understanding of programming and some knowledge of the fundamentals of signal acquisition. The project will occur in two phases: the first phase will involve designing a basic high-frequency signal acquisition system using an FPGA and RF ADCs/DACs, while the second phase will focus on how to extract the desired NMR signal from the acquired data. |
| **Required Technical Skills** | Required technical skills<br>• Background in Electrical Engineering or biomedical engineering<br>• Basic knowledge of programming controllers<br>• Basic knowledge of electrical circuits<br>• Experience with RF systems is considered a bonus |