Lukas Cha

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Research Interests

Wearable technology, biomechanics, soft robotics, mechatronic design, applied machine learning and controls

Education

M.Sc. Mechanical Engineering *Munich, Germany*
Technical University of Munich *2022 - present*

- Coursework focus: Mechatronics, Control Theory, Robotics, Machine Learning
- Current German Grade: 1.6 (expected graduation: September 2024)

B.Sc. Mechanical Engineering *Munich, Germany*
Technical University of Munich *2018 - 2022*

- Electives focus: Mechatronics, Dynamics, Control Theory
- Bachelor's thesis: "Time-optimal Trajectory Parameterisation in Task Space", graded 1.3
- Overall German Grade: 2.3

Research Experience

Visiting Research Student *London, UK*
Imperial College London - Biomechatronics Lab *April 2023 - September 2023*

- Advisor: Prof. Ravi Vaidyanathan
- Researched transparency control strategies for a lower-limb rehabilitative exoskeleton
- Paper (1st author) accepted at ICRA 2024
- During my stay in the lab, I helped collect Machine Learning training data for a colleague in their bio-inspired robotic whiskers project

Undergraduate Research Assistant *Munich, Germany*
Technical University of Munich - Chair of Applied Mechanics *April 2022 - April 2023*

- Advisor: Prof. Daniel Rixen
- Biomechanics Lab: Analysed neuromuscular control model for human walking on Simulink; Performed sensitivity analysis of the model to investigate the importance of model parameters; Computed deformation and rigid body movement of foot from walking experiment videos; Setup and performed motion capture using open source motion capture software

Bachelor's Thesis Research *Munich, Germany*
Technical University of Munich - Chair of Applied Mechanics *March 2021 - December 2021*

- Advisor: Prof. Daniel Rixen
- Thesis: "Time-optimal Trajectory Parameterisation in Task Space"
- Investigated time optimisation strategies in task space for a robot manipulator with a focus on orientation interpolation
- Paper (2nd author) accepted at ICRA 2023

Teaching Experience

Undergraduate Teaching Assistant *Munich, Germany*
Technical University of Munich - Chair of Vibroacoustics *October 2021 - March 2022*

- Course: Engineering Dynamics (Technical Mechanics 3)
- Answered questions during tutorial hours and presented problem solutions ($\sim$ 100 students)

Undergraduate Teaching Assistant *Munich, Germany*
Technical University of Munich - Chair of Data-driven Materials Modeling *April 2021 - September 2021*

- Course: Modeling of Data and Uncertainties in Engineering (Statistics course)
- Created online quizzes and marked mid-terms ($\sim$ 300 students)

Publications

J. Wittmann, **L. Cha**, M. Kappertz, P. Seiwald, D. Rixen. 2023. Spherical Cubic Blends: $\mathcal{C}^2$-Continuous, Zero-Clamped, and Time-Optimized Interpolation of Quaternions. 2023 IEEE International Conference on Robotics and Automation (ICRA).

Accepted

L. Cha, A. Guez, C. Chen, S. Kim, Z. Yu, B. Xiao, R. Vaidyanathan. 2023. Transparency Control of a 1-DoF Knee Exoskeleton via Human-in-the-loop Optimisation. 2024 IEEE International Conference on Robotics and Automation (ICRA).

Under Review

Z. Yu, S. Kim, **L. Cha**, S. Jing, Z. Liu, X. Chen, R. Vaidyanathan. 2023. Bio-inspired Tapered Whisker-based Active Reservoir Computing System for Robot Rapid Tactile Objects Classification. IEEE Sensors Journal.

Professional Experience

Pre-study engineering internship *Munich, Germany*

Futronika AG *May 2018 - July 2018*

- Learned about machining along with other manufacturing methods as well as quality control

Professional Development & Extracurriculars

Attended Conferences

2023 **International Conference on Robotics and Automation (ICRA) 2023**, Co-presented poster

2023 **Hamlyn Symposium on Medical Robotics 2023**, Volunteering and workshop attendance

Awards and Honours

2024 **Germany Scholarship (Deutschlandstipendium) (1800€)**, For excellent academic performance

2024 **TUM Erasmus+ Internship Scholarship (4200€)**, For research stays abroad

2023 **DAAD PROMOS Scholarship (1900€)**, For research stays abroad

Student Clubs

2022 - 2023 **TUM DASH - Lower-limb exoskeleton development**, Joint Control Team

2020 - 2021 **TUM Phoenix Robotics**, Mechanical Design Team

Technical Skills

Programming Languages: MATLAB/Simulink, Python, C++

Software: PyTorch, ROS, Linux, Microcontrollers, CAD (Autodesk Inventor)

Languages

German - Fluent

English - Fluent

Chinese - Fluent

References

Prof. Daniel Rixen (rixen@tum.de) - Technical University of Munich

Prof. Ravi Vaidyanathan (r.vaidyanathan@imperial.ac.uk) - Imperial College London

Dr. Bo Xiao (b.xiao@imperial.ac.uk) - Imperial College London