Sean Maroofi

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EDUCATION

Hamburg University of Technology (TUHH) **August 2023**

M.Sc. in Mechatronics, with distinction, top 8.5% of all graduates

- *Thesis:* "Dynamic Model Inversion of a Soft Robot"
- *Supervisors:* Prof. Robert Seifried, Prof. Christian J. Cyron

University of California, Berkeley (UCB) **August 2021 – May 2022**

Study Abroad Program, Faculty of Mechanical Engineering

- *Research project:* "Interface for the Application of Reinforcement Learning in Autonomous Driving"
- *Supervisors:* Prof. Masayoshi Tomizuka, Prof. Robert Seifried

Hamburg University of Technology **September 2020**

B.Sc. in Mechanical Engineering (concentration: Mechatronics)

- *Thesis:* "Acoustic Localization of Micro Underwater Robots by Means of Kalman Filtering"
- *Supervisors:* Prof. Christian Renner, Prof. Robert Seifried

RESEARCH EXPERIENCE

Research Associate **June 2024 - Present**

Institute of Logistics Engineering, TUHH

- Extended a robot state machine for automated mobile delivery robots to safely enter and exit public transport vehicles in compliance with the German Association of the Automotive Industry (VDA) guidelines.
- Deployed a mobile robot for gathering various sensor measurements, including cameras, IMU, LiDAR, wheel encoders, GNSS as part of the ROS2 MRCD robot data set for SLAM and localization algorithm development.
- Evaluated and compared LISLAM and VISLAM approaches to highlight key challenges and features of MRCD.
- Simulated delocalization of mobile robots in a warehouse environment in NVIDIA ISAAC Sim.
- Designed a control loop to gather time series data of the robot for training of delocalization prediction.

Master's Thesis **January 2023 – September 2023**

Institute of Mechanical and Ocean Engineering, TUHH

- Conducted research on dynamic model inversion of soft robots for stable control and real-time trajectory tracking, fusing underactuated multibody system control together with piecewise constant curvature assumption.
- Derived the inverse model applying the servo-constraints approach, analyzing the forward model's numerical and control stability with respect to step size, system singularities, and pole positions in the root locus diagram.
- Studied the impact of discretization degree and trajectory velocity on tracking accuracy at both positional and velocity levels, evaluating the robot's performance in tracking complex trajectories with its end effector.

Graduate Research Assistant **August 2021 – May 2022**

Mechanical Systems Control Lab, UCB

- Developed a framework to apply reinforcement learning (RL) control applying the *INTERACTION* dataset within a simulation environment for autonomous driving in complex, highly interactive urban traffic scenarios.
- Applied the Soft-Actor-Critic algorithm to train an agent, optimizing its decision-making in dynamic traffic.
- Designed and analyzed reward function configurations by incorporating scene-specific metrics to study the convergence to the optimal driving policy, while evaluating the simulation's suitability as a training environment.

WORK EXPERIENCE

Automation Engineer R&D **March 2024 – May 2024**

Altona Analytics GmbH, Hamburg

- Designed and implemented algorithms for highly precise dilution and pipetting processes on a robotic workstation, accelerating processing time for in-vitro PCR testing preparation and enhancing overall efficiency.
- Tested and optimized the algorithms on the actual machine maintaining contamination control standards.

Technical Internship **September 2017 – October 2017**

Optima Pressformen GmbH & Co. KG, Hamburg

- Acquired hands-on experience in the basics of product manufacturing in pellet mill matrices production.
- Constructed a pneumatic-driven machine, utilizing traditional metalworking techniques (milling, turning, filing, drilling, smoothing, and deburring) along with industry-standard tools and equipment.
- Managed incoming and outgoing goods, ensuring product quality and compliance with transportation safety standards. Oversaw shipping processes, ensuring adherence to safety regulations and inspection requirements.

TEACHING EXPERIENCE

Teaching Assistant, Design and Implementation of Software Systems **October 2022 – March 2023**

Institute for Autonomous Cyber-Physical Systems, TUHH

- Advised and mentored students on incorporating sensor data into a Kalman-Filter and programming robots to autonomously solve an unknown, randomized maze using Lego Mindstorms robotics kits.
- Led lab sessions for a group of 60+ students, reinforcing key concepts in object-oriented programming, UML diagrams, and code architecture, with a focus on robotics applications.

Teaching Tutor, Engineering Design Project **October 2019 – March 2020**

Institute for Product Development and Mechanical Engineering Design, TUHH

- Instructed a group of 12 students the principles of technical drawing, focusing on how to read, interpret, and create detailed technical drawings of a functional assembly that adhered to ISO standards.
- Demonstrated the use of standard measuring and drawing tools with a physical model, ensuring students understood their practical application while providing personalized feedback.
- Graded students' technical drawings, assessing compliance with ISO standards.

FELLOWSHIPS

International Study and Training Partnerships (ISAP) – University of California, Berkeley **2021-2022**

German Academic Exchange Service (DAAD)

One of four students selected nationally for a funded academic exchange program between TUHH and UCB.

WORKING PAPERS

MRCD - Mobile Robot Campus Dataset for Evaluating SLAM Algorithms on Wheeled Robots **April 2025**

In review at IEEE Robotics and Automation Practice (RA-P)

Authors: Ziegenbein, J.*, Blunder N.*, Maroofi S.*, Thiel M., Nguyen, T., Rose, H., Braun P., Jahn C.

Description: "This work presents a dataset for the development of algorithms for outdoor autonomous mobile robots."

Dynamic Model Inversion of a Soft Robot using Servo Constraints

In Preparation for Multibody System Dynamics Journal

Co-authors: Maroofi, S., Grube, M., Seifried, R.

Description: "This study explores applying the servo-constraints method for dynamic trajectory tracking of soft robots."

WORKSHOPS

Integrating Delivery Robots into Public Transport **May 2025**

Ready 4 Robots Workshop on Autonomous Delivery and Service Robots on Pedestrian and Cycle Paths

Authors: Thiel, M., Blunder, N., Maroofi, S., Ziegenbein, J., Rose H.

Description: "Industry–Academia dialogue on persistent challenges in urban robot applications across Germany.

Flowcean: Bridging Machine Learning and ROS 2 for Smarter Robotics **May 2025**

Submitted to ROSCon 2025 Conference

Authors: Maroofi, S., Knitt, M.

Description: "A talk about the machine learning framework Flowcean and its integration into the ROS framework."

SKILLS

Programming Languages: Python, C++, MATLAB, Java, LaTeX

Libraries & Frameworks: NumPy, PyTorch, SciPy, Pyomo, Polars, OpenCV, Simulink, ROS1 & 2, Flowcean

Development and Tools: Autodesk Inventor, Git, Docker, Linux, Apriltags, Inkscape, NVIDIA Isaac Sim

LANGUAGES

German (native), English (professional), Latin (proficiency certificate), Spanish (beginner)

REFERENCES

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