# Haolei Tong

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Darmstadt Germany Google Scholar

## Education

**TU Darmstadt** *Darmstadt, Germany*
*Master of Science, Autonomous systems and robotics* *Oct. 2022 - Oct. 2025*

- GPA: 1.85
- **Coursework:** Foundations of Robotics, Data Mining and Machine Learning, Deep Learning, Reinforcement Learning

**Zhejiang University of Science and Technology (ZUST)** *Zhejiang, China*
*Joint Bachelor's Program with FH Westküste, Germany* *Sep. 2017 – Aug. 2021*
*Bachelor of Science, Electrical Engineering and Automation*

- GPA: 1.9

## Research Experience

**Constrained Planning for Multi-Robot Collaboration** *PEARL, TU Darmstadt*
*student research assistant* *Oct. 2024 - Present*

- Introduced an NLP-based constrained sampling strategy to generate diverse, feasible configurations across foliated constraint manifolds.
- Tested the method on real-world dual-arm robotic platforms, including Franka Emika and Tiago.

**Collision Handling in Simulation and SLAM UI Development** *SIM, TU Darmstadt*
*student research assistant* *Sep. 2023 - Sep.2024*

- Integrated collision detection mechanisms for both the robot and objects in the Webots simulation environment; visualized real-time collision states in RViz.
- Designed and implemented virtual line segments to act as collision triggers, along with a timing mechanism to record collision duration upon contact.
- Developed a lightweight UI on Raspberry Pi for handheld SLAM applications, featuring start/stop control, topic selection, and data recording status display.

## Publication and Preprint

**Adaptive Diffusion Constrained Sampling for Bimanual Robot Manipulation** *May 2025*
*Haolei Tong, Yuezhe Zhang, Sophie Lueth, Georgia Chalvatzaki*
Accepted at Workshop on The Rational Robots Workshop, CoRL 2025
arxiv.org/abs/2505.13667

## Master Thesis

**Adaptive Diffusion Constrained Sampling for Bimanual Robot Manipulation** *PEARL, TU Darmstadt*
*Dec. 2024 - May 2025*
*Supervised by M.Sc. Yuezhe Zhang and Prof.'in Georgia Chalvatzaki, Ph.D*

- Proposed a generative sampling framework that integrates equality and inequality constraints into a unified energy-based diffusion model for dual-arm manipulation.
- Designed a Transformer-based mechanism for adaptive weighting of constraint-specific energies during in-

ference, enabling context-aware sampling.

- Achieved high sample diversity and constraint satisfaction through a two-phase sampling strategy combining Langevin dynamics and density-aware resampling.

## Academic Projects

**Narrow Passage Detection and Control Algorithm for Autonomous Ground Robots** *github.com/NPDC*

- Implemented fast narrow passage detection using elevation maps via circular iterative expansion.
- Generated paths close to narrow passages based on arc geometry.
- Designed a Model Predictive Controller (MPC) to avoid collisions within narrow passages.

**Multi-Robot Pick and Place** *github.com/MRPP*

- Two robotic arms collaborate to complete the object grasping task.
- Computed the position of the second end-effector based on the first end-effector's pose and the object's geometry.
- Performed path planning using RRT and the KOMO optimization framework.

## Bachelor Thesis

**Implementation of the IoT Gateway Based on PiZero** *ZUST*

- Developed an IoT gateway using C++ on Raspberry Pi-Zero to support wireless sensor networks in IoT applications.
- Integrated LoRa and MQTT protocols to enable reliable communication between terminal sensors and the platform.
- Designed and implemented core functionalities including terminal device configuration and bidirectional data communication, and conducted real-world testing.

## Other Experience

**Course Tutor** *IAS, TU Darmstadt*
*Robot Learning* *Oct. 2023 - Mar. 2024*

- Responsible for Robot Learning course assignment grading and Q&A.

## Honours and Awards

**Outstanding Graduate Award (Top 5%)** *2021*
**First-class School scholarships** *2020, 2021*
**Second Place, China Robotics Competition** *2019, 2020*

## Programming Skills

**Languages:** Python, C++, C, C#
**Technologies:** Franka Robot, TIAGo Robot, ROS, Git, Gazebo, Webots, Isaac Sim, Rviz

## References

**Prof. Georgia Chalvatzaki, Ph.D**
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