

Honghao Zhu

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Education

Carnegie Mellon University 09/2022 – 05/2024
Master of Science in Mechanical Engineering-Research | GPA: 3.98/4.0
Pittsburgh, PA

- Selected Courses: Robot Dynamics and Analysis, Robot Localization and Mapping, Computer Vision, Optimal Control

Georgia Institute of Technology, College of Engineering 08/2018 – 08/2022
Bachelor of Science in Mechanical Engineering, Minor in Computer Science | GPA: 3.67/4.0 (Highest Honor)
Atlanta, GA

Publication

- Shibo Zhao*, **Honghao Zhu*** (*equal contribution) et al., *SuperLoc: The Key to Robust LiDAR-Inertial Localization Lies in Predicting Alignment Risks*, under review at **ICRA 2025** [arXiv](#) | [Video](#) | [Website](#)
- Sean J. Wang, **Honghao Zhu** et al., *Pay Attention to How You Drive: Safe and Adaptive Model-Based Reinforcement Learning for Off-Road Driving*, accepted at **ICRA 2024** [arXiv](#) | [Video](#)

Research Experience

[ICRA 2025] SuperLoc: Robust Localization through Predicting Alignment Risk, Pittsburgh, PA 03/2024 – Present

Advisor: [Aaron Johnson](#), [Sebastian Scherer](#)

- Designed and integrated a localization module for analyzing trajectory results and providing a ground truth point cloud map
- Conducted predict alignment risk and observability estimation to enable early LiDAR degeneracy detection
- Active sensor fusion based on predict alignment risk for robust performance and numerical stability
- Implemented and open-sourced **Robustness Metrics** for trajectory evaluation using Python
- Result in 49.7% performance increase compared to other SOTA LiDAR-Inertial odometry method

[ICRA 2024] Pay Attention to How You Drive, Pittsburgh, PA 06/2023 – 09/2023

Advisor: [Aaron Johnson](#)

- Proposed a novel transformer and LSTM-based model for autonomous four-wheel robot driving in diverse field environments
- Enhanced pipeline adaptability by 41% by integrating real-time state-action sequence feedback into LSTM model
- Optimized framework pipeline, achieving efficient communication between three modules at a 10 Hz path planning rate

Lightweight LiDAR-Inertial Odometry with Scene Graph Representation, Pittsburgh, PA 03/2024 – Present

Advisor: [Sebastian Scherer](#)

- Implemented support for Livox-Mid360 in [SuperOdometry](#)
- Implement RGB colorization support to enable realistic 3D map construction
- Generated 3D scene graph from semantic representation using colorized 3D map [Demo Video](#)

Inertial Navigation Learning for Shaky Perception, Pittsburgh, PA 09/2022 – Present

Advisor: [Aaron Johnson](#), [Sebastian Scherer](#)

- Designed and trained CNN and GRU networks for IMU measurement correction and motion prediction
- Implemented Pose Graph Optimization using PyPose library for IMU and motion network trajectory fusion

Robotic Arm Graffiti Painting, Atlanta, GA 08/2021 – 08/2022

Advisor: [Frank Dellaert](#)

- Simulated painting and paint-dipping actions using a Franka Emika Panda robotic arm with ROS MoveIt and Gazebo
- Created demo video showcasing robotic arm painting capabilities [Demo Video](#)

Midea Research Intern, Shanghai, China 04/2021 – 08/2021

- Designed and implemented test standard sheets for evaluating sensors, including LiDAR and RGB-D units from various manufacturers; optimized sensor budget by 40% through cost-effective selection based on testing outcomes

Academic Projects

Receding Horizon State Estimator, Pittsburgh, PA 02/2024 – 05/2024

- Implemented receding horizon state estimator in Julia for SpaceX Dragon1 docking simulation

Automated Wheel System Design Project, Atlanta, GA 08/2021 – 12/2021

- Designed and developed an autonomous wheel system using Arduino, 3D modeling, fabrication, and 3D printing

Skills

Language: Chinese, English, German (elementary proficiency)

Programming: C++, Python, Java, Julia, Git, ROS, Gazebo, MATLAB, Arduino

Prototyping: CAD (SolidWorks), 3D Printer, Basic Fabrication