

Lingjun Zhao

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EDUCATION

- University of Michigan** Ann Arbor, USA
• *M.S. in Robotics; GPA: 4.00/4.00* Aug 2022 - April 2024
Courses: Math for Robotics, Robotics System Lab, Computer Vision, Mobile Robotics, Robot Learning for Planning and Control, Introduction to Robotic Manipulation, Autonomous Vehicles, etc.
- Tianjin University** Tianjin, China
• *B.S. in Mechanical Design, Manufacturing and Automation; GPA: 3.81/4.00* Sep 2018 - June 2022
Courses: Mechanical Design and Manufacturing, Mechanics, Control of Mechatronic Systems, Introduction to Robotics, Introduction to Artificial Intelligence, Introduction to Electrical Engineering, etc.

RESEARCH INTERESTS

- **Robot Perception:** Object Detection / Tracking, Instance Segmentation, Semantic Scene Completion
- **Sensor Fusion:** LiDAR-Camera-Radar Fusion for Autonomous Vehicles, Vision-Tactile Fusion for Robotic Manipulation
- **Robot Learning:** Machine Learning and Reinforcement Learning for Robot Planning and Control
- **Robot Localization and Mapping:** Semantic Mapping, NeRF-based Robot Localization

SKILL

- **Programming Languages:** Python, C/C++, MATLAB
- **Frameworks and Tools:** PyTorch, MMDetection3D, ROS, Linux, Docker, GIT
- **Engineering Softwares:** SolidWorks, Creo, AutoCAD, ABAQUS, Adams
- **Languages:** Mandarin, English (TOEFL: 107; GRE: 322+4.0)

PUBLICATION

- **CRKD: Improving a Camera-Radar 3D Object Detector using Knowledge Distillation** In Progress
Lingjun Zhao, Jingyu Song, Katherine A. Skinner
 - **Early Voxel KD:** Propose an early voxel KD pipeline to transfer dense voxel information from LiDAR to radar.
 - **Middle Feature KD:** Perform intra-, cross- and multi-modality KD to distill knowledge in BEV feature maps.
 - **Late Response KD:** Conduct KD on the output level and make the student mimic the prediction of the teacher.
- **LiRaFusion: Deep Adaptive LiDAR-Radar Fusion for 3D Object Detection** Submitted
Jingyu Song, Lingjun Zhao, Katherine A. Skinner *IEEE ICRA 2024*
 - **Early Voxel Fusion:** Design an early fusion module for joint voxel feature encoding.
 - **Middle Feature Fusion:** Design a middle fusion module to adaptively fuse feature maps via a gated network.
 - **3D Object Detection:** Perform 3D object detection on NuScenes to demonstrate LiRaFusion leverages the complementary information of LiDAR and radar effectively and achieves notable improvement over existing methods.
- **A Tactile Sensor with Slippage Prediction by Unequal Height Dome Array** Accepted
Yong Yang, Meirong Zhao, Yifan Jia, Lingjun Zhao, Dongji Piao, Yelong Zheng, Le Song *IEEE SENSORS*
 - **Tactile Sensor Design:** Engage in the design of a high-resolution vision-based tactile and slip sensor integrated on a manipulator aimed at helping robots ensure safe contact and move objects safely in case of a possible collision.
 - **Contact Mechanics Model:** Utilize finite element analysis method to construct the contact mechanics model and optimize the arrangement law of unequal height dome array.
 - **Slippage Prediction:** Improve the adaptability of the touch and slip sensor to the shape characteristics of the object, and prolong the pre-sliding window period and realized the sliding prediction function of smooth plate.

PROJECT

- **Loc-NeRF++: An Enhanced Robot Localization using Neural Radiance Fields** University of Michigan
Course Project, supervised by Prof. Maani Ghaffari Jan 2023 - Apr 2023
 - **Outdoor Scenes Extension of Loc-NeRF:** Scale up Monte Carlo Localization to large outdoor environments using NeRF models and complete its evaluation on the OMMO dataset.
 - **Adaptive Particle Filter:** Improve the existing particle filter used in Loc-NeRF by applying KLD-Sampling which adjusts the number of particles to perform more precise and real-time localization.
- **Ordinary Differential Equation Based Learning Dynamics for Robotic Systems** University of Michigan
Course Project, supervised by Prof. Nima Fazeli and Prof. Dmitry Berenson Jan 2023 - Apr 2023
 - **Learning-based Dynamics Model:** Train and compare discrete numerical differential equation based networks with continuous neural ordinary differential equation based networks.
 - **Robot Planar Pushing Simulation:** Complete the Panda robot planar pushing simulation using different ODE-based dynamics models and a MPPI controller, leading to the smoothness comparison of the pushing trajectories.
 - **Open-source Dynamics Dataset Evaluation:** Evaluate the ODE-based dynamics models on the open-source Forward Dynamics Dataset using KUKA LWR and Baxter.

- **Depth-aware and Laplacian-steered Instance Style Transfer** University of Michigan
Course Project, supervised by Prof. Andrew Owens *Sep 2022 - Dec 2022*
 - **Semantic Segmentation:** Perform semantic segmentation using Fully Convolutional Network and SegNet, compare and evaluate their segmentation performance on the PASCAL VOC 2012 Dataset.
 - **Depth-aware and Laplacian-steered loss:** Introduce depth-aware loss and Laplacian-steered loss into neural style transfer to keep the content image with more depth and detailed information.
 - **Instance Style Transfer:** Combine semantic segmentation with neural style transfer to perform instance style transfer to stylize specific objects within one natural image using different artistic styles.
- **Ophthalmic Surgical Robot Micro-manipulator Design** Tianjin University
Individual Final Year Research, supervised by Prof. Fujun Wang *Dec 2021 - June 2022*
 - **Origami Mechanism Design:** Design a novel origami-based parallelogram RCM mechanism composed of flexure hinges and rigid body as the main structure of the invasive ophthalmic surgical robot.
 - **Kinematics Modelling and Simulation:** Complete the forward and inverse kinematics modelling and the robot motion simulation using the rigid-flexible coupling method.
 - **Dynamics Modelling and Simulation:** Establish the input stiffness model and the output flexibility model of the surgical robot, and evaluate its dynamics performance via finite element analysis.
 - **Parameter Optimization:** Optimize the robot's dimension parameters to improve its input and output stiffness.

EXPERIENCE

- **UM Ford Center for Autonomous Vehicles (FCAV)** University of Michigan
Graduate Research Assistant, supervised by Prof. Katherine A. Skinner *Jan 2023 - Present*
- **Laboratory of Micro/Nano Manufacturing Technology** Tianjin University
Summer Intern, supervised by Prof. Le Song *May 2021 - Sep 2021*
- **Key Laboratory of Mechanism Theory and Equipment Design** Tianjin University
Undergraduate Research Assistant, supervised by Prof. Fujun Wang *Apr 2020 - June 2022*

HONOR AND AWARD

- National Scholarship of China (**Top 0.2%**) - September, 2021
- Weichai Power Scholarship (**Top 5%**) - November, 2020
- Merit Student of Tianjin University - 2019, 2020, 2021