# Ziwei Liao

Toronto Robotics and AI Laboratory
Institute for Aerospace Study (UTIAS)
Vector Institute, Robotics Institute
University of Toronto

Website: ziwei-liao.github.io
Email: ziwei.liao@mail.utoronto.ca
Google Scholar

Research Interests

My long-term goal is to make robots and machines perceive, understand, and interact with 3D environments to help humans in the real world. My past research focuses on 3D vision and learning, including 3D representations (NeRF and Gaussian Splattings), SLAM, Pose and Shape Estimation, Generative Models as priors, and Uncertainty Modeling.

Education

**University of Toronto**, Toronto, Canada, Sep 2021-Aug 2025 (*Expected*)
**Ph.D. Candidate**, Institute for Aerospace Study (UTIAS)
Affiliated with the Vector Institute, and the Robotics Institute

**Beihang University**, Beijing, China
**M.Sci.**, Computer Vision and Robotics, Sep 2018-July 2021
**B.Eng.**, Mechatronics Engineering, Sep 2014-July 2018

Research Experiences

**University of Toronto**, Research Assistant, Sep 2021-Present
Toronto Robotics and AI Lab, Supervisor: Prof. Steven L. Waslander
Project: Deep Learning for 3D Objects Reconstruction and Pose Estimation

**Niantic Labs, London, UK**, Research Intern, June 2024-Present
The augmented reality company that developed Pokémon GO.
Research & Dev Team, Mentor: Dr. Michael Firman, Prof. Gabriel Brostow
Project: 3D Gaussian Splatting Reconstruction with Generative Models

**Microsoft Research Asia**, Research Intern, 2022-2023
Intelligent Multimedia & Visual Computing Group, Mentor: Dr. Chunyu Wang
Project: 3D Human Pose Estimation with Transformers

**Beihang University**, Research Assistant, 2019-2021
Autonomous Robots Lab, Supervisor: Prof. Wang Wei
Project: Object-level SLAM with Spatial Structural Constraints

**Beihang University**, Research Assistant, 2018-2020
Autonomous Robots Lab, Supervisor: Prof. Wang Wei
Project: Mapping and Localization with Point, Lines and Planes

**Megvii Research** (Face++), Research Intern, 2018-2019
SLAM and Robotics Group
Project: Semantic Localization from Segmented Images for Vehicles

**Tsukuba University**, Japan, Research Assistant, 2017-2018
Intelligent Robot Lab, Supervisor: Prof. Akihisa Ohya
Project: Semantic Navigation with Floor Map for Indoor Robots

Academic Service

Conference Reviewer: CVPR 2023-2024, ECCV 2024, NeurIPS 2024, ICRA 2023-2024, WACV 2024-2025, ICLR 2025
Journal Reviewer: IJRR, IEEE RA-L

Publications

9. *Toward General Object-level Mapping from Sparse Views with 3D Diffusion Priors*
**Ziwei Liao**, Binbin Xu, Steven L. Waslander
Conference on Robot Learning (**CoRL**), 2024

8. *Multiple View Transformers for 3D Human Pose Estimation*
**Ziwei Liao***, Jialiang Zhu*, Chunyu Wang, Han Hu, Steven Waslander
Computer Vision and Pattern Recognition (**CVPR**), 2024

7. *Uncertainty-aware 3D Object-Level Mapping with Deep Shape Priors*
**Ziwei Liao***, Jun Yang*, Jingxing Qian*, Angela P. Schoellig, Steven L. Waslander
International Conference on Robotics and Automation (**ICRA**), 2024

6. *Multi-view 3D Object Reconstruction and Uncertainty Modelling with Neural Shape Prior*
**Ziwei Liao**, Steven L. Waslander
Winter Conference on Applications of Computer Vision (**WACV**), 2024

5. *SO-SLAM: Semantic Object SLAM with Scale Proportional and Symmetrical Texture Constraints*
**Ziwei Liao**, Yutong Hu, Jiadong Zhang, Xianyu Qi, Xiaoyu Zhang, Wei Wang
IEEE Robotics and Automation Letters (**RA-L**) (presented at **ICRA** 2022)

4. *RGB-D Object SLAM using Quadrics for Indoor Environments*
**Ziwei Liao**, Wei Wang, Xianyu Qi, Xiaoyu Zhang
Sensors (Journal), 2020

3. *Coarse-To-Fine Visual Localization Using Semantic Compact Map*
**Ziwei Liao**, Jieqi Shi, Xianyu Qi, Xiaoyu Zhang, Wei Wang, Yijia He, Ran Wei, Xiao Liu
International Conference on Control and Robots, 2020, (Best Session Presentation)

2. *Stereo plane slam based on intersecting lines*
Xiaoyu Zhang, Wei Wang, Xianyu Qi, **Ziwei Liao**
International Conference on Intelligent Robots and Systems (**IROS**), 2021

Publications

1. *Point-Plane SLAM Using Supposed Planes for Indoor Environments*
Xiaoyu Zhang, Wei Wang, Xianyu Qi, **Ziwei Liao**, Ran Wei
Sensors (Journal), 2019

Manuscripts

1. *Object-oriented SLAM using Quadrics and Symmetry Properties for Indoor Environments*
**Ziwei Liao**, Wei Wang, Xianyu Qi, Xiaoyu Zhang, Lin Xue, Jianzhen Jiao, Ran Wei
arXiv, 2020

Awards

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| 2022 | Mary H. Beatty Fellowship, University of Toronto |
| 2021 | DiDi Scholarship |
| 2020 | **National Scholarship**, Ministry of Education, China |
| 2018 | Chinese National Robocon Robotics Competition (Second Award) |
| 2018 | Outstanding Graduate of Beijing, China |

Leadership

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| 2016-2018 | Vice-Captain, the Robotics Team, Beihang University |
| 2015-2016 | President, the Students Association of Robotics, Beihang University |

Languages and Skills

English, Chinese (native)
Python, PyTorch, C++, Deep Learning
Multi-view Geometry, Numerical Optimization, Statistics & Probability
Sensors (RGB-D, laser/lidar, odometry, IMU)