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 (Link)

Research Interests

My research focuses on the intersection of 3D vision, generative models, and computer graphics. I am interested in building a world model, which is essential for enabling machines to perceive, understand, and interact with real-world 3D environments. It has broad applications in physical embodied AI, including robotics and augmented reality.

Education

University of Toronto, Canada Sep 2021-Aug 2025 (*Expected*)
Ph.D. Candidate in Computer Vision and Robotics
Toronto Robotics and AI Lab, Supervisor: Prof. Steven L. Waslander
Thesis: Learning 3D Representation, Generation and Reconstruction from Images

Beihang University, Beijing, China
formerly as Beijing University of Aeronautics and Astronautics (BUAA)

M.Sci., Computer Vision and Robotics Sep 2018-July 2021
Autonomous Robots Lab, Supervisor: Prof. Wang Wei
Thesis: Object-level SLAM with Spatial Structural Constraints

B.Eng., Mechatronics Engineering Sep 2014-July 2018
Thesis: Semantic Mapping and Navigation for Indoor Robots

Research Experiences

Niantic Labs, London, UK - Research Intern June 2024-Dec 2024
The 3D mapping company spun off from Google Maps and developed Pokémon GO.
Research Team, Mentor: Dr. Michael Firman
Project: 3D Gaussian Splatting Reconstruction with Denoising Diffusion Models [10]

Microsoft Research Asia, Beijing, China - Research Intern 2022-2023
Intelligent Multimedia & Visual Computing Group, Mentor: Dr. Chunyu Wang
Project: Multi-view Multi-person 3D Human Pose Estimation with Transformers [8]

Megvii Research (Face++), Beijing - Research Intern 2018-2019
SLAM and Robotics Group, Mentor: Dr. Jieqi Shi and Xiao Liu
Project: Semantic Localization from Segmented Images for Autonomous Vehicles [3]

Beihang University, Beijing - Research Assistant 2018-2020
Autonomous Robots Lab, Supervisor: Prof. Wang Wei
Project: Simultaneous Localization And Mapping with Points, Lines and Planes [1,2]

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

[*] represents the resulting publication ID listed below.

Academic Service

Conference Reviewer: CVPR 2023-2024, ECCV 2024, NeurIPS 2024,
ICRA 2023-2024, ICML 2025, ICLR 2025
WACV 2024-2025

Journal Reviewer: The International Journal of Robotics Research (IJRR)
IEEE Robotics and Automation Letters (RA-L)

Publications & Manuscripts

10. *Complete Gaussian Splats from a Single Image with Denoising Diffusion Models*
Ziwei Liao, Mohamed Sayed, Steven L. Waslander, Sara Vicente,
Daniyar Turmukhambetov, Michael Firman
International Conference on Computer Vision (**ICCV**), 2025, *under review, to appear in arXiv*

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, Spotlight**), 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 (Best Session Presentation), 2020

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

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

Leadership	*Vice Captain*, the Robotics Team for Robocon at Beihang University	2016-2018
	President, the Robotics Student Association at Beihang University	2015-2016
Awards	Mary H. Beatty Fellowship, University of Toronto	2022
	DiDi Scholarship, UTIAS Department, University of Toronto	2021
	National Scholarship, Ministry of Education, China	2020
	Chinese National University Robot Competition (Robocon) - Second Award	2018
	Outstanding Graduate of Beijing, China	2018
Technical Proficiency	Programming: Python, PyTorch, C++	
	3D Representations: Gaussian Splatting, Implicit Representations (NeRFs, SDFs)	
	Generative Models: VAEs, Diffusion Models, Uncertainty Quantification	
	AI Infrastructure: Large-scale training on compute clusters	
	Theory: Deep Learning, Multi-view Geometry, Optimization, Probabilistics	
Languages	English (Professional Proficiency), Chinese (Native), Japanese (JLPT N2)	