

Runhao (Rain) Li

+1 (778) 316-9072

rainli10@engineering.upenn.edu

rainli10.github.io

linkedin.com/in/rain-li

EDUCATION

University of Pennsylvania

Master of Science in Engineering in Robotics

Jan 2027 – Expected in Dec 2028

Philadelphia, PA

University of Toronto

Bachelor of Applied Science in Engineering Science with Honours; Robotics Engineering

Sept 2021 – June 2026

Toronto, ON

- **cGPA: 3.83/4.00**; Dean's Honour List (all terms); Mathematical & Computational Sciences Research Award.

RESEARCH & INDUSTRY EXPERIENCE

Researcher

May 2025 – June 2026

Toronto Robotics and AI Lab (TRAILab), UTIAS

Toronto, ON

- Designed and implemented **AgentVLN**, augmenting a **VLN** backbone with hierarchical **scene-graph memory** for task-conditioned retrieval and persistent spatial understanding; improved R2R-CE success rate from 54.0% to 62.6%.
- As part of *AgentVLN*, developed an **agentic reasoning loop** for landmark tracking, navigation progress monitoring, deviation detection, and recovery; adapted a downstream **reinforcement learning** based locomotion policy to execute VLN decisions as physical Husky motion in Isaac Sim, with reward shaping for obstacle avoidance.
- Deployed and evaluated **OpenNav** on a Husky robot across indoor and outdoor environments, integrating multi-sensor perception for long-horizon navigation and resolving sensor-fusion instability through precise cross-sensor time synchronization to enable reliable real-world operation.
- Contributed to **STaR**, a long-horizon multimodal **robot-memory** framework for **task-conditioned retrieval and embodied reasoning**; refined its 3D memory pipeline and improved cross-frame object association to maintain consistent object identities over time; co-authored the resulting RA-L paper.

Researcher

May 2025 – Sept 2025

Robotics Vision & Learning (RVL) Lab, University of Toronto Robotics Institute

Toronto, ON

- Proposed and developed a novel **sparse-view 4D Gaussian Splatting** method by extending state-of-the-art single-view 4DGS with inter-camera attention and 3D motion-tracklet fusion, reducing required camera views from **~20 to ~4** while maintaining the same reconstruction quality on real-world robotic manipulation scenes.
- Contributed to integrating the resulting 4D scene into an **adversarial study** on iterative **Diffusion Policy** learning framework, with controllable **scene augmentation** over objects and appearance to identify policy failure modes and guide targeted retraining on adversarial failure cases.

Co-op Assistant Researcher for Autonomous Driving

May 2024 – May 2025

Noah's Ark Lab, Huawei Canada

Markham, ON

- Enhanced **relightable 3D Gaussian Splatting** by decoupling illumination from scene appearance and geometry, enabling robust reconstruction across varying lighting conditions for autonomous-driving scenes.
- Built and optimized the whole end-to-end implementation of **UniGaussian**, unifying fisheye and pinhole cameras for multi-camera 3D Gaussian Splatting; co-authored the resulting 3DV 2026 paper.
- Independently proposed and developed a single-image-to-3D pipeline addressing fine-detail degradation in **diffusion-based 3D generation**, using multi-view fusion and optical-flow feature transfer to recover fine-details.

Algorithm Developer Intern & System Architect Assistant

May 2023 – Sept 2023

SenseTime Inc.

Shanghai, China

- Developed a **NeRF-based 3D reconstruction** pipeline for crop phenotyping, improving occluded-fruit reconstruction via cross-view consistency and integrating 3D traits into a multimodal fruit-trait prediction pipeline.

PROJECT HIGHLIGHTS

Gesture-Aware Autonomous Human-Following Drone, Undergraduate Capstone

Jan 2026 – Apr 2026

- Co-built a from-scratch autonomous drone with **Jetson Nano**, RGB/RealSense sensors; **led** developing the **perception to-control** stack including human tracking, closed-loop flight control, and learning-based gesture recognition.

Risk Map Prediction for Autonomous Driving

Jan 2026 – Apr 2026

- Designed a dense driving risk-map prediction framework using Depth Anything estimates and a custom **depth-gated SegFormer** for RGB Semantic-depth fusion, reaching pixel accuracy 92.3% on unseen datasets.

SKILLS

- **Programming:** Python, C++, C, MATLAB, SystemVerilog
- **ML & Robotics:** PyTorch, ROS/ROS2, Isaac Sim, OpenCV, Open3D, Habitat, Gazebo, Genesis, CARLA
- **Tools & Languages:** Linux, Git, $\text{\LaTeX}$; English (Proficient), Mandarin (Native)