Yufeng Liu

Robotics, SLAM, and Multi-modal Sensor Fusion
Nanyang Technological University

NTU Singapore
raymond.lau.lyf@gmail.com
github.com/raymond-lau-lyf

Work Experience

Nanyang Technological University *Singapore*

RA **Research Assistant,** CARTIN *Aug.2025–present*

Education

Nanyang Technological University *Singapore*

M.Sc. **Computer Control and Automation** **GPA:4.0** *Aug.2024–Aug.2025*

Thesis: 4D Radar Aided Thermal-Inertial SLAM System

Harbin Institute of Technology(Shenzhen) *Shenzhen,China*

B.Eng. **Automation** **GPA:87** **Outstanding Thesis** **IELTS 6.5** *Sept.2020–Jun.2024*

Thesis: LiDAR-Inertial-Thermal SLAM for Perception-Degraded Environments

Publications

[1] **Degradation-Aware LiDAR-Thermal-Inertial SLAM.** *IEEE Robotics and Automation Letters(RA-L)*, 10(8):8035-8042, 2025. Y. Wang*, **Y. Liu*(Co-First Author)**, L. Chen, H. Chen, and S. Zhang. [link]

[2] **Edge-based Monocular Thermal-Inertial Odometry in Visually Degraded Environments.** *IEEE Robotics and Automation Letters(RA-L)*, 8(4):2078-2085, 2023. Y. Wang, H. Chen, **Y. Liu**, and S. Zhang. [link]

Research Experiences

My research to date has focused on SLAM in degraded environments, multi-modal sensor fusion, and real-world deployment for autonomous navigation. In addition, I am open to contributing to broader topics in robotics and machine intelligence.

4D Radar and Stereo Thermal Camera Based SLAM for firefighting robots CARTIN**, NTU**
Supervisor: Prof. Danwei Wang *Oct.2024-present*

- **Participated in the research of a 4D Radar and Stereo Thermal Camera based SLAM and 3DCV.**
  - Participated in developing an novel loosely coupled SLAM algorithm for fusing 4D milimiter radar,stereo thermal camera and IMU.
  - Participated in developing a radar-thermal based BEV Occupancy mapping, preforming the best Occupancy performance among all LiDAR-based or radar-camera-based baselines.
  - Participated in developing a thermal multi view stereo and mapping based on visual-geometry foundation models.

Intelligent Fireman Helmet under Harsh Environments CARTIN**, NTU**
Supervisor: Prof. Danwei Wang *Oct.2024-present*

- **Design and Development of Intelligent Wearable Devices for Fireman under Harsh Fire Environments.**
  - Planned the sensor layout and designed a thermally insulated enclosure for the smart firefighting helmet, supported by thermal simulations and physical validation.
  - Developed sensor-side drivers and integrated stereo thermal–camera IMU odometry workflows, complemented by 3D reconstruction techniques built upon visual foundation modules.
  - Created a command-station system for seamless communication with the helmet, supporting real-time visual feeds, telemetry data exchange, and 3D scene reconstruction.

Thermal Cam and LiDAR Based Robust SLAM in Challenging Environments nROS-Lab**, HITsz**
Supervisor: Prof. Haoyao Chen *Oct.2021-Jun.2024*

- **Proposed a Degradation-Aware LiDAR-Thermal-Inertial SLAM [publication[1]].**
  - Individually designed a novel complete Thermal-LiDAR-Inertial SLAM framework specially designed for sensor-degeneration scenes, which is based on an adaptive sensor fusion based iterated error state Kalman Filter, as well as cross modality data association.
  - Developed a mapping scheme to generate dense thermal map by adaptively fusing thermal and LiDAR.
  - Designed the multi sensor suit and collected data for robots in smoke environments.
  - (This project is my Undergraduate Final Year Project & Dissertation, which won the HITsz Outstanding Final Year Project & Dissertation Award(Top1% of All))
- **Participated in the project of obstacle avoidance and robust localization and mapping in dynamic environments.**
  - Applied a learning-based detector for target detection and removal to upgrade LiDAR odometry in human-crowded or cars dynamic environments.
  - Designed shared memory scheme for pointcloud data acceleration.
- **Participated in the research of an Edge-Based Monocular Thermal-Inertial Odometry [publication[2]].**
  - Jointly developed a Thermal-Inertial Odometry novelly used edge features based on Difference of Gaussian of thermal infrared image.
  - Jointly adjust the algorithm based on an adaptive switch scheme for LK optical flow traking between edge image and distance transform image.

Teleoperated robot equipped with a VR remote-controlled gimbal system nROS-Lab, HITsz *Oct.2022–Sept.2023*
Supervisor: Prof. Haoyao Chen

- **Designed a two-axis gimbal with sensors for mobile robots.**
  - Designed the 3D model and implemented real-time embedded control.
  - Developed a algorithm framework for human-computer interaction, as well as a VR application.
  - Deployed the proposed thermal-LiDAR-inertial SLAM algorithm on the robot.

Awards

- Outstanding Undergraduate Final Year Project & Dissertation Award - Top1% of All 2024
- First Prize of 2022 RoboMaster University Championship 2022
- First Prize of 2022 RoboMaster Sentry Robot Practice Prize (as team leader) 2022
- First Prize of 2021 RoboMaster University Championship 2021
- Third Prize of China Undergraduate Mathematical Contest in Modelling 2021
- First Place among all students of Competition of the HITsz Robot Design and Practice Course 2020

Competition

Team leader of Sentry Robot Group in RoboMaster competitionCritical-HIT robot team,HITsz *Oct.2020–Aug.2022*

- Led the Sentry Robot Group in HITsz Critical-HIT RoboMaster Team.
  - Designed a fully automatic inspection and combat-integrated robot.
  - Coordinated task allocation and fostered collaboration among team members as team leader.
  - Developed the embedded control based on STM32 by C-Lang; jointly designed the 3d model; jointly developed automatic target aiming algorithm framework based on yolo and tracking framework.

Internship

Underwater Grab Automation **Lujian Technology Ltd. Co.,Shenzhen** *Jun.2022–Jul.2022*

- Participated in the design of an underwater grab robot; developed feature-based visual-inertial odometry for underwater environments.

Skills

Programming: C++, Python, C, MATLAB