

# JUNWOON LEE

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## REASEARCH INTEREST

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Mobile robotics, SLAM, Path planning, Exploration, Computer vision, Field robotics

## EDUCATION

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### University of Tokyo

April, 2023 - March, 2025 (expected)

M.E.S. Student in Human & Engineered Environmental Studies

- Thesis: Switching-based Multi-modal SLAM for Extreme and Degraded Environments (expected)
- Advisor: Prof. Atsushi Yamashita
- Focus: Localization and mapping robust in sensor degeneration

### Osaka University

April, 2017 - March, 2023

B.E. in Mechanical Engineering

- Thesis: LiDAR-visual SLAM for Online Mapping of Unpaved Road Surface
- Advisor: Project Prof. Masamitsu Kurisu<sup>†</sup>
- Focus: 3D mapping for unpaved road surface, LiDAR-visual SLAM, Field robotics

## PUBLICATIONS

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### Journal Papers

- [1] **Switch-SLAM: Switching-Based LiDAR-Inertial-Visual SLAM for Degenerate Environments**  
Junwoon Lee, Ren Komatsu, Mitsuru Shinozaki, Toshihiro Kitajima, Hajime Asama, Qi An, Atsushi Yamashita  
*IEEE Robotics and Automation Letters (RA-L)*, 2024. (Presented at ICRA@40) [Link]
- [2] **Three-dimensionalized Feature-Based LiDAR-visual Odometry for Online Mapping of Unpaved Road Surface**  
Junwoon Lee, Masamitsu Kurisu, Kazuya Kuriyama  
*Journal of Field Robotics (JFR)*, 2024. [Link]

### Conference Papers

- [1] **TC-LTIO: Tightly-coupled LiDAR Thermal Inertial Odometry for LiDAR and Visual Odometry Degraded Environments**  
Junwoon Lee, Taisei Ando, Mitsuru Shinozaki, Toshihiro Kitajima, Qi An, Atsushi Yamashita  
*International Conference on Control, Automation and Systems (ICCAS)*, 2024.
- [2] **Highly Accurate and Fast Two-view Pose Estimation by Fast Reduction of Spherical Image Distortion Effects**  
Taisei Ando, Junwoon Lee, Mitsuru Shinozaki, Toshihiro Kitajima, Qi An, Atsushi Yamashita  
*International Conference on Control, Automation and Systems (ICCAS)*, 2024.

### Under Review

- [1] **Self-TIO: Thermal-Inertial Odometry via Self-supervised 16-bit Feature Extractor and Tracker**  
Junwoon Lee, Taisei Ando, Mitsuru Shinozaki, Toshihiro Kitajima, Qi An, Atsushi Yamashita  
*IEEE Robotics and Automation Letters (RA-L)*

## REASEARCH EXPERIENCE

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Reasearch Assistant, University of Tokyo

April, 2023 - Present

Real World Robot Informatics Lab.

- Focus: LiDAR-visual / Thermal / Learning-based localization and mapping
- Developed LiDAR-visual-Inertial SLAM robust to sensor degeneration.
- Developing Thermal-Inertial SLAM robust to dark, dusty, and foggy environments.
- Published a paper in RA-L on LiDAR-visual SLAM for each sensor degenerate environments.

- Advisor: Prof. Atsushi Yamashita, Associate Prof. Qi An, Assistant Prof. Ren Komatsu, and Prof. Hajime Asama

**Research Assistant**, Osaka University

*April, 2022 - March, 2023*

Komatsu MIRAI Construction Equipment Cooperative Research Center

- Focus: 3D Mapping system for automated maintenance of unpaved road in mining sites
- Developed a unpaved road surface mapping system using a novel tightly-coupled LiDAR-visual odometry.
- Published a paper in JFR and a Japanese patent on road surface mapping system.
- Advisor: Project Prof. Masamitsu Kurisu<sup>†</sup>

## HONORS AND AWARDS

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**IEEE RAS Travel Grant**

*September, 2024*

- Travel support for participation in ICRA@40.

**Rotary Yoneyama Memorial Foundation Scholarship**

*April, 2023 - March, 2025*

- Full scholarship for academic achievement and excellent records.

**Korea-Japan Joint Government Scholarship**

*April, 2017 - March, 2023*

- Government-sponsored full scholarship, living stipend and full tuition fee waiver.

## SKILLS

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**Research Skills**

- Program Languages : C/C++, Python, MATLAB
- Computer Vision : OpenCV, Open3D, PCL
- SLAM/Optimization : GTSAM, Ceres Solver, g2o
- Deep Learning : PyTorch, TensorRT, LibTorch, Keras, TensorFlow
- Other : ROS, Git, LaTeX, Arduino, Raspberry Pi, 3D CAD, Blender

**Languages**

- English (Professional)
- Japanese (Professional)
- Korean (Native)

## PATENT

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1. Kaoru Adachi, Masamitsu Kurisu, Junwoon Lee, "Terrain Detection System and Method.", *Japanese Patent 2023-105215*, Filed on June 27, 2023.

## TEACHING

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**Teaching Assistant**, UTokyo FEN-SC3102S1 Exercises for Mathematics 2C

*April, 2024 - July, 2024*

## SERVICES

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**Reviewer Services**: RA-L, ICCAS

**Special Lecturer, Rotary Club of Funabashi-West/East**

*April, 2023 - March, 2025*

- Lectured about introduction to mobile robotics and artificial intelligence

**Sergeant, Republic of Korea Army**

*April, 2020 - October, 2021*

- Frontline guardian on coastline observation post in the 23rd Security Brigade

## REFERENCES

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**Ph.D. Atsushi Yamashita**

Professor, The University of Tokyo  
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**Ph.D. Qi An**

Associate Professor, The University of Tokyo  
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**Ph.D. Ren Komatsu**

Computer Vision Engineer, Mujin, Inc.  
komatsu@robot.t.u-tokyo.ac.jp

**Ph.D. Kazuya Kuriyama**

Project Professor, Osaka University  
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