

Junnosuke Kamohara

Robotics PhD, Georgia Institute of Technology.
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Education

- PhD in Robotics, Georgia Institute of Technology** — Atlanta United States Aug 2024–present
Institute for Robotics and Intelligent Machines
Laboratory for Intelligent Decision and Autonomous Robots (LIDAR)
Advisor: Ye Zhao, Seth Hutchinson
Research area: Humanoid Locomotion, Deformable Terrain Model, Model Predictive Control, Deep Reinforcement Learning, Skill Learning/Coordination.
- MS in Mechanical and Aerospace Engineering, Tohoku University** — Sendai Japan Oct 2023–June 2024
Graduate School of Engineering, Department of Aerospace Engineering — Voluntary withdrawal
Advisor: Kazuya Yoshida
- BS in Mechanical and Aerospace Engineering, Tohoku University** — Sendai Japan Apr 2020–Sep 2023
Department of Mechanical and Aerospace Engineering — 1 semester early graduation,
GPA: 3.53/4.00 (President Award).
Advisor: Kazuya Yoshida

Publication

[Preprint]

J. Kamohara, F. Wu, C. Wamorkar, S. Hutchinson, and Y. Zhao. "RL-augmented Adaptive Model Predictive Control for Bipedal Locomotion over Challenging Terrain," (*under review*), 2025.

[Conference Papers]

- J. Kamohara, V. Ares, J. Hurrell, K. Takehana, A. Richard, S. Santra, K. Uno, E. Rohmer, and K. Yoshida. "Modeling of terrain deformation by a grouser wheel for lunar rover simulation," *Conference of the International Society for Terrain-Vehicle Systems*, 2024.
- A. Richard*, J. Kamohara*, K. Uno, S. Shreya, D. van der Meer, M. Olivares-Mendez, K. Yoshida, "OmniLRS: A Photorealistic Simulator for Lunar Robotics," *International Conference on Robotics and Automation*, 2024. (*equal contribution)
- J. Kamohara, K. Sakamoto, A. Ohsato, S. Tomie, M. Kataoka, M. Kawano, "Development and evaluation of Neural Simulator for autonomous driving systems," *The 38th Annual Conference of the Japanese Society for Artificial Intelligence*, 2024.
- K. Tabata, J. Kamohara, R. Unno, M. Sato, T. Watanabe, T. Kume, Y. Negishi, R. Okada, Y. Iwasawa, Y. Matsuo, "Construction and Validation of Action-Conditioned VideoGPT", *The 37th Annual Conference of the Japanese Society for Artificial Intelligence*, 2023.
- Y. Negishi, M. Sato, R. Unno, K. Tabata, T. Watanabe, J. Kamohara, T. Kume, R. Okada, Y. Iwasawa, Y. Matsuo, "Scaling Laws of Dataset Size for VideoGPT", *The 37th Annual Conference of the Japanese Society for Artificial Intelligence*, 2023.
- M. Sato, R. Unno, Y. Negishi, K. Tabata, T. Watanabe, J. Kamohara, T. Kume, R. Okada, Y. Iwasawa, Y. Matsuo, "Scaling Laws of Model Size for World Models", *The 37th Annual Conference of the Japanese Society for Artificial Intelligence*, 2023.

[Presentation]

- J. Kamohara, K. Sakamoto, A. Ohsato, S. Tomie, M. Kataoka, M. Kawano, "Development and evaluation of Neural Simulator for autonomous driving systems," *The 38th Annual Conference of the Japanese Society for Artificial Intelligence*, Hamamatsu, Japan, May, 2024.
- A. Richard*, J. Kamohara*, K. Uno, S. Shreya, D. van der Meer, M. Olivares-Mendez, K. Yoshida, "OmniLRS: A Photorealistic Simulator for Lunar Robotics," *International Conference on Robotics and Automation*, Yokohama, Japan, May, 2024. (*equal contribution)
- A. Richard, D. van der Meer, G. Garcia, L. Chovet, J. Kamohara, S. Bogh, "Towards a common robotics simulator for lunar environments?," *IEEE SMC-IT & SCC 2023*, Caltech Pasadena, CA, 2023.

Awards

- Nakajima Foundation Scholarship Program** — Sep 2024 – Aug 2029
The program supports tuition (maximum 3 million JPY, equivalent to 20,000 USD) and a monthly stipend of 300,000 JPY, equivalent to 2,000 USD. Tuition is supported for the first two years.

Skills

Programming Python, C/C++, MATLAB

Robotics IsaacSim/IsaacLab, Mujoco, Gazebo, ROS1/ROS2, Humanoid robot, Wheeled robot

Software Deep Learning (Pytorch, Tensorflow, Warp), Optimization (CasADi, OSQP, qpOASES), RL (RSL-RL, rl-games), Docker, OpenCV, SolidWorks, Fusion360, EAGLE

Job Experience

Georgia Institute of Technology, Graduate research assistant — Atlanta, United States Feb 2024 – Apr 2024

- PhD research advised by Dr. Ye Zhao and co-advised by Dr. Seth Hutchinson.

University of Luxembourg SpaceR, Research assistant — Luxembourg Feb 2024 – Apr 2024

- Developed reinforcement learning-based spacecraft rendezvous in orbital robotics applications.
- Integrated sensor and software on spacecraft hardware simulator in SpaceR.

Guide Robotics, Robotics & AI Intern — Tokyo, Japan Dec 2022 – Feb 2024

- Benchmarked visual inertial SLAM algorithms with outdoor data from clients.
- Tested visual-inertial SLAM on Luxonis OakD camera.
- Built a simulator for warehouse and office environments using Isaac-Sim and Gazebo Ignition.
- Developed Nav2-based behavior planning in the office environment.

Matsuo Institute UTokyo, AI Intern — Tokyo, Japan Nov 2021 – Dec 2023

- Developed neural camera and LiDAR simulations using neural implicit models.
- Implemented unsupervised domain adaptation of point cloud semantic segmentation.
- Implemented action conditioned VideoGPT for path prediction in autonomous driving.
- Evaluated scaling law in video prediction models.

Zero to One, AI Intern — Tokyo, Japan Mar 2021 – Dec 2022

- Developed a chat system based on BERT and KNN designed to educate medical students for clinical interviews.
- Created teaching materials for the Japanese deep learning qualification exam (JDLA Deep Learning for Engineer).

Robotics Projects

Bipedal locomotion on granular media using cleated foot interaction Aug 2024 – present
Georgia Institute of Technology, PhD research collaboration with Dr. Daniel Goldman.

- This projects introduces "cleats" which consists of thin plates extending vertically from the foot.
- Optimally spaced cleats allow the granular material to remain near or below the yielding stress, facilitating low-slip locomotion.
- We demonstrate successful system scalability from a robophysical model to a 3D unconstrained bipedal robot on 15deg granular media slope.

RL-augmented adaptive model predictive control for bipedal locomotion over challenging terrain Aug 2024 – Sep 2025
Georgia Institute of Technology, PhD research

- This project focuses on model predictive control (MPC) and reinforcement learning (RL) combined approach to enhance robustness and versatility of MPC.
- Our method parametrizes three key components of single-rigid-body-dynamics-based MPC: the system dynamics, the swing-leg controller, and the gait frequency.
- We validate our approach through bipedal robot simulations in NVIDIA IsaacLab across various terrains, including stairs, stepping stones, and low- friction surfaces.

System integration on wheeled rover Oct 2023 – June 2024
Tohoku University, Undergraduate Project

- Upgraded the hardware components (power system and actuators) on Moonraker from Google Lunar XPrize and enhanced software capability with ROS2.
- Implemented a skid-steering controller in C++ and low-level motor control in micro-ROS.

OmniLRS: A photorealistic simulator for lunar robotics

June 2022 – Sep 2023

Tohoku University, Undergraduate Research

- Developed an open-source photorealistic lunar simulator on top of NVIDIA IsaacSim and evaluated its photorealism against real-world data.
- Evaluated sim-to-real transfer by measuring the performance gap between models trained with synthetic images and hardware images in an instance segmentation task, where synthetic data with automatic annotations were generated with Omni-verse Replicator and actual data recorded by RealSense D435 were manually labeled with RoboFlow.

Behavior planning in the office environment

Sep 2023 – Feb 2024

Guide Robotics Inc., Internship project supervised by Dr. Aveek Das

- Developed a behavior planning system based on ROS2 navigation (Nav2) targeting autonomous data collection in office environments.
- Integrated this planning system into the Clearpath Turtlebot4 platform.

Integration of OakD camera for SLAM and object detection

July 2023 – Sep 2023

Guide Robotics Inc., Internship project supervised by Dr. Aveek Das

- Worked on OpenCV chessboard calibration of a stereo camera to ensure accurate depth perception.
- Implemented the program to convert the Darknet yolov4-tiny model into MyriadX blob format to run neural networks on the camera's RVC2 chip.

Benchmark of visual inertial SLAM algorithms

Apr 2023 – June 2023

Guide Robotics Inc., Internship project supervised by Dr. Aveek Das

- Compared the performance of open-source visual SLAM algorithms, including ORB-SLAM3 and Elbrus-SLAM, against our closed-source VIO algorithm.
- Compared the estimated trajectory and ground truth from RTK GPS and calculated the error using evo, a Python package for trajectory evaluation.
- Verified that our VIO algorithm realizes much less drift than other VIO algorithms.

Data-driven simulator for autonomous driving

June 2022 – Dec 2023

R&D with TIER IV.inc.

- Developed a data-driven simulator to enable photorealistic camera and LiDAR simulation for autonomous driving applications.
- Worked on image and LiDAR point cloud synthesis and surface extraction based on NeRF using the custom dataset recorded by TIER IV, and reported that the SDF-based model shows much better geometric consistency than NeRF-based methods.
- Implemented Urban Radiance Fields from Google Research, though the NeRF-based solution suffered from poor geometry reconstruction in outdoor environments with few multi-view images.
- Implemented Python dataset classes and PyTorch dataloaders to convert the dataset in MMDetection3D format into a data format compatible with NeRF.
- Evaluated the model performance on both the Waymo Block-NeRF dataset and custom datasets from TIER IV.

Unsupervised domain adaptation in LiDAR semantic segmentation

Nov 2021 – Mar 2023

R&D with TIER IV.inc.

- Implemented an unsupervised domain adaptation algorithm for point cloud semantic segmentation proposed in the paper (<https://arxiv.org/abs/2107.09783>).
- Evaluated the effect of domain adaptation on the LiDAR semantic segmentation model SalsaNext to assess its effectiveness in bridging domain gaps.