Robin Inho Kee

Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI
+1 (734)-707-3407 inhokee@umich.edu LinkedIn Github Personal Website

Education

University of Michigan **Aug 2023 – Dec 2024**
Master of Science in Mechanical Engineering *Ann Arbor, MI, USA*

- Relevant Course: Math for Robotics (A+), Linear Systems Theory (A0), Design of Digital Control Systems (A0), Computational and Data-Driven Methods in Engineering (A+), Model Predictive Control (A+), Robot Kinematics and Dynamics (A+), Adaptive Control (A0), Convex Optimization Methods in Control (A+)

Yonsei University **Mar 2016 – Feb 2022**
Bachelor of Science in Mechanical Engineering | Military Service: Oct 2020 – Feb 2022 *Seoul, South Korea*

- Thesis: Linear motor active damper for precision manufacturing vibration reduction *(PI: Prof. Jun Young Yoon)*

Research Interest

Resilient Autonomy, Safety-Critical Control, Uncertainty- and Risk-Aware Planning, Learning-Driven Robust Decision-Making

Publications

: Equally Contributed

In progress

1. Sangdo Kim*, Jeonguk Kang*, **Robin Inho Kee**, Sunwoo Kim, Choa Kim, Youngsu Cha, Yisoo Lee, Kanggeon Kim, Jongwon Lee, "Towards Daily Life Sarcopenia Detection: Deep Learning-Based Gait Analysis Using Wearable Hip Assistive Robot", *IEEE Transactions on Industrial Informatics*, *Under Review* [Project Page]
2. Jin-Hee Lee, Dahyun Nam, **Robin Inho Kee**, YoungKey Kim, Seok-Jun Buu, "Vision-Ultrasound Robotic System based on Deep Learning for Gas and Arc Hazard Detection in Manufacturing", *Engineering Applications of Artificial Intelligence*, *Under Review*
3. **Robin Inho Kee***, Taehyeun Kim*, Anouck Girard, Ilya Kolmanovsky, "Safe Adaptive Cruise Control for Autonomous Vehicles using Time Shift Governor-Guided MPC-CBF", *IEEE Conference on Control Technology and Applications (CCTA)*, 2025, *Under Review* [Project Page]

Journals

1. **Robin Inho Kee**, Dahyun Nam, SeokJun Bu, Sung-Bae Cho, "Disentangled Prototyping with Triplet-trained Prototypical Network for Few-shot Learning in In-vehicle Noise Classification", *IEEE Access*, 2024 [Paper] [Project Page]
2. Hobin Kim, Jongbok Lee, Sunwoo Kim, **Inho Kee**, Sangdo Kim, Shinsuk Park, Kanggeon Kim, Jongwon Lee, "Gait Phase Estimation Method Adaptable to Changes in Gait Speed on Level Ground and Stairs", *The Journal of Korea Robotics Society*, 2023
3. Byonghun Kim, Sunghyun Hong, Inwook Oh, Yangwoo Lee, **Inho Kee**, Saeyong Lee, "Measurement of ankle joint movements using IMUs during running", *Sensors*, 2021 [Paper] [Project Page]

Conferences

1. Taekyung Kim, **Robin Inho Kee**, Dimitra Panagou, "Learning to Refine Input Constrained Control Barrier Functions via Uncertainty-Aware Online Parameter Adaptation", *IEEE International Conference on Robotics and Automation (ICRA)*, 2025, *Accepted* [arxiv] [Project Page] [Github]
2. Taehyeun Kim*, **Robin Inho Kee***, Ilya Kolmanovsky, Anouck Girard, "Constrained Control for Autonomous Spacecraft Rendezvous: Learning-based Time Shift Governor", *AIAA SciTech Forum*, 2025 [Paper] [arxiv] [Project Page]
3. Dahyun Nam, **Inho Kee**, Seok-Jun Bu, SungBae Cho, "Dynamic Prototype-guided Memory Replay for In-Vehicle Noise Classification", *Korea Data Mining Society*, 2023, **SAS Student Paper Award** [Project Page]
4. Woojin Jo, Sehyun Hwang, **Inho Kee**, Soohong Lee, "An Intelligent Lock-Out Tag-Out System for Monitoring and Control of the Locked Device", *IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)*, 2019 [Project Page]

Research Experiences

Graduate Research Assistant, University of Michigan **Jan 2024 – Present**
Vehicle Optimization, Dynamics, Control and Autonomy Lab (PI: Prof. A. Girard and I. Kolmanovsky) *Ann Arbor, MI, USA*

- Developed a learning-based Time Shift Governor (L-TSG) to address computational challenges in spacecraft rendezvous and docking under dynamic constraints in elliptic orbits and the SpaceX Crew3 mission, integrating a constraint-guided recurrent neural network, achieving 10x faster computation while maintaining robustness [Project Page]
- Designed and implemented a TSG-guided MPC-CBF framework for adaptive cruise control (ACC) on curved roads, enabling real-time adaptation to dynamic uncertainties like sudden braking or lead vehicle reversals, reducing computation time by 50% and enhancing robustness [Project Page]

Researcher, Yonsei University **Mar 2023 – Aug 2023**

Soft Computing Lab (PI: Dr. Seok-Jun Bu) *Seoul, South Korea*

- Engineered a disentangled prototypical convolutional network for advanced in-vehicle noise classification, enhancing few-shot learning in automotive acoustic analysis with accuracy of 96.81% on a 9-way 1-shot task [Project Page]
- Presented novel in-vehicle noise classification deep learning model using dynamic prototype-guided memory replay method demonstrating 6.38% improvement in accuracy

Research Intern, Korea Institute of Science and Technology **Jul 2022 – Jul 2023**

Assistive and Interactive Robotics Lab (PI: Dr. Jongwon Lee) *Seoul, South Korea*

- Improved wearable hip complex assistive robot with 4DOF active joint [Project Page]
- Developed a deep learning model for estimating foot trajectory by fusing data from hip exoskeleton and insole sensors, achieving 100% accuracy in identifying sarcopenia patients through gait parameter analysis.
- Led and administered motion capture system (Motion Analysis) experiments over 40 subjects, including patients and outdoor hiking experiments over 200km

Research Engineer, Yonsei University **May 2020 – May 2021**

Integrative Sports Science Research Lab (PI: Prof. Byong Hun Kim) *Seoul, South Korea*

- Initiated and developed a portable real-time ankle angle analysis audio-visual feedback system [Project Page]
- Validated IMU measurement of joint kinematics against Vicon system using a developed wearable device
- Conceptualized subtalar joint angle estimation algorithm with random forest method

Research Intern, Seoul National University **Apr 2020 – Oct 2020**

Innovative Design and Integrated Manufacturing Lab (Advisor: Prof. Sung-Hoon Ahn) *Seoul, South Korea*

- Developed lab automation (tensile test) using an autonomous mobile manipulator
- Integrated communication nodes of +5 lab facilities and the robot with ROS
- Customized modular mechanical end effector implemented with torque and position controller
- Devised low-cost appropriate robotic manipulator (Open quasi-direct drive robot)

Undergraduate Research Intern, Yonsei University **Jul 2019 – Dec 2019**

Knowledge-Based Design Lab (Advisor: Prof. Soo-Hong Lee) *Seoul, South Korea*

- Established hardware and control system of smart lock-out tag-out IoT system for the engineering plant
- Integrated real-time cloud-based controller and P&ID VR system with Unity

Selected Awards and Honors

SAS Student Paper Award, Conference of Korea Data Mining Society, Korea Data Mining Society, 2023
1st Place, International S.M.A.R.T Startup Competition, Innovative Technology and Energy Center, 2020
2nd Prize, Robot Open Source Lab, Samsung Open Source Conference, 2019
Science and Engineering Undergraduate Internship Program Scholarship Yonsei University, 2020
Academic Excellence Scholarship Yonsei University, 2018, 2019
Academic Honors in Yonsei University, 2019, 2020
Academic Highest Honors in Yonsei University, 2019, 2020

Extracurricular experience

Yonsei University Alumni Association at the University of Michigan **Jul 2024 – Present**

Vice President *University of Michigan, MI, USA*

Roboin, Robotics club **Jun 2018 – Aug 2023**

Advisory Committee (2020-2023), President (2019) *Yonsei University, Seoul, South Korea*

- Administered and directed various seminars, projects, and competitions related to robotics
- Selected mainly led projects
  - Autonomous fire extinguisher (Autonomous driving, detecting, and extinguishing heat source) [Project Page]
  - Teo-Jansen mechanism autonomous robot (Completed missions using OpenCV and tiny-YOLOv4) [Project Page]

Military Service

1st Fighter Wing, Republic of Korea Air Force **Oct 2020 – Jul 2022**

Staff Sergeant, Military Intelligence Airman *Gwangju, South Korea*

- Received honorable discharge and recognized as the top sharpshooter among over a thousand peers.
- Enhanced command decision-making by delivering critical intelligence briefings and analyzing national security threats.