

Byoungkwon Yoon

School of Mechanical Engineering, Purdue University, IN, USA

yoons358@purdue.edu | (+1)765-543-8250 | <https://bkyoon-research.github.io> | Google Scholar

Research Interests: Robot Perception, 3D Scene Reconstruction, Robot Learning, and Dexterous Manipulation

EDUCATION

Purdue University, IN, USA

Aug. 2025 – Aug. 2028 (est.)

PhD in Mechanical Engineering

Research Focus: Robot Perception, 3D Scene Understanding, and Dexterous Manipulation in Complex Environments

Seoul National University, Seoul, South Korea

Mar. 2023 – Feb. 2025

Master's Degree in Mechanical Engineering

Cumulative GPA: 3.94/4.3

Research Focus: Mobile Robotics, Perception, and State Estimation

Thesis Title: Directional Correspondence Based Cross-Source Point Cloud Registration for USV-UAV Cooperation in Wild Outdoor

Korea University, Seoul, South Korea

Mar. 2017 – Feb. 2023 (2-year mandatory military service)

Bachelor's Degree in Mechanical Engineering

Cumulative GPA: 4.03/4.5

RESEARCH EXPERIENCE

Learning Unmodeled Particle Dynamics for Robot-Based Pneumatic CNC Chip Removal

2025 – Present

Government-Funded Project, KIMM

- Developing an automated pneumatic CNC chip-removal system using a 6-axis robotic manipulator.
- Building GPU-accelerated particle simulations in NVIDIA Warp to model and analyze airflow-driven chip dynamics.
- Investigating learning-based methods to capture unmodeled particle dynamics for robotic chip-removal planning and control.

Digital Twinning of Precision Manufacturing Environments

2025 – Present

Government-Funded Project, MOTIE

- Developing LiDAR-guided 3D scene reconstruction methods to improve geometric consistency of radiance-field representations for robot simulation.
- Investigating methods to reconstruct simulation-ready 3D scenes from visual sensors for contact-rich robotic simulation.

Control and Planning of USVs in Inland-Water Environments

2023 – 2025

Government-Funded Project

- Developed path-planning and control systems for an autonomous surface vehicle for green-algae removal in inland-water environments.
- Developed LiDAR/camera/IMU/GNSS-based perception, state-estimation, and navigation pipelines for autonomous USV operation.

Indoor UAV Localization Using UWB

2022 – 2023

Research Project

- Designed and experimentally validated an indoor localization system for micro-UAVs using ultra-wideband (UWB) ranging.
- Developed UWB ranging models and embedded hardware/software for localization experiments.

Machine Learning-Based Point Cloud Segmentation for 3D Vascular Imaging

2020 – 2022

Undergraduate Project

- Developed a point-cloud-based 3D vascular analysis method for cancer-related morphological analysis.
- Built a supervised PointNet-based segmentation pipeline.

PUBLICATIONS

Journal Articles

- H. Lee, Y. Sim, J. Jang, **B. Yoon**, *et al.* Toward Provably Safe AI-Driven Perception and Motion Planning for Robotic Manufacturing: A Review. *Journal of Manufacturing Systems*, 2026.
- J. Kang, J. Choe, D. Kong, **B. Yoon**, *et al.* Fast and Robust Online Initialization of Monocular Visual-Inertial Odometry via One-Dimensional Cost Approximation. *IEEE Transactions on Robotics*, 2026.
- **B. Yoon**, S. Hong, D. Lee. Directional Correspondence Based Cross-Source Point Cloud Registration for USV-AAV Cooperation in Lentic Environments. *IEEE Robotics and Automation Letters*, 2025.
- W. Lee, **B. Yoon (Co-first)**, *et al.* Machine Learning-Aided Three-Dimensional Morphological Quantification of Angiogenic Vasculature in the Multiculture Microfluidic Platform. *BioChip Journal*, 2023.

Conference Papers

- **B. Yoon**, *et al.* LiDAR-Integrated Coarse-to-Fine Optimization for Geometrically Consistent Triangle Splatting from Mobile Robots. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2026.
- T. Kim, **B. Yoon**, D. Lee. UWB-Based Localization System Considering Antenna Anisotropy and NLOS/Multipath Conditions. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2024.
- T. Kim, **B. Yoon**, D. Lee. UWB-Based Localization System Considering Antenna Anisotropy and NLOS Conditions. *Institute of Control, Robotics and Systems (ICROS)*, 2024.

PROFESSIONAL EXPERIENCE

Seoul National University Future Mobility Technology Center

Researcher

Seoul, South Korea

Jan. 2025 – Aug. 2025

- Designed an RC car-based robotics education program covering autonomous navigation and mobile robot fundamentals.
- Developed and deployed real-time LiDAR-based localization and autonomous navigation on NVIDIA Jetson for an RC-scale mobile robot.

Antreon (Startup Company)

Founding Member / Hardware Engineer

Seoul, South Korea

2023 – Jan. 2024

- Designed a powered assistive device for patients with hand tremors.
- Developed control algorithms for device actuation and motion stabilization.
- Implemented embedded software for real-time sensing and hardware control.

HONORS AND AWARDS

Scholarship

- Undergraduate Scholarship, Songam Foundation 2017 – 2022

Awards

- Outstanding Master's Thesis Award, Seoul National University 2025
- Outstanding Student Award, Department of Mechanical Engineering 2022
- Outstanding Student Award, Department of Mechanical Engineering 2021

SKILLS

- **Programming:** C/C++, Python, CUDA
- **Robotics:** ROS/ROS 2, State Estimation, Motion Planning, Navigation, Robot Control
- **3D Vision:** 3D Reconstruction, 3D Gaussian Splatting
- **ML & Simulation:** PyTorch, NVIDIA Warp
- **Technical:** Dynamics, Control Theory