# Hojun Lee

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## Education

- **Purdue University, West Lafayette** *2023 - Present*
  Ph.D. in Mechanical Engineering GPA: 3.66/4.0
- **University of Michigan, Ann Arbor** *2020 - 2022*
  M.S. in Robotics GPA: 3.92/4.0
- **Purdue University, West Lafayette** *2014 - 2020*
  B.S.E. in Mechanical Engineering GPA: 3.76/4.0

## Professional Experience

- **Graduate Teaching Assistant,** Purdue University, West Lafayette *2025 - Present*
- **Graduate Research Assistant,** Purdue University, West Lafayette *2023 - Present*
- **Research Associate,** University of Michigan, Ann Arbor *2022 - 2023*
- **Graduate Research Assistant,** University of Michigan, Ann Arbor *2021 - 2022*
- **Undergraduate Research Assistant,** Purdue University, West Lafayette *2019 - 2020*

## Journal Publications

**‡: Equal contribution** ***: Corresponding author**

- **Lee, H.**, Sim, Y., Han, C., Jun, M., & Lee, J.* (2025). GRAVITION++: Graph-based Robust Resampling Algorithm for Visual Inference in Target Object Localization and Certification [In preparation].
- **Lee, H.**, Sim, Y., Han, C., Jun, M., & Lee, J.* (2025). BRIDGES: Bi-directional Robotic Integration with Digital-twin for Generalized, Efficient, and Safe Automation in Manufacturing [In preparation].
- Sim, Y., Lee, J., **Lee, H.**, Yun, D., Myeong, N., Hwang, Y., Park, H., Jun, M., & Kim, E.* (2025). Sound Data Augmentation Using Frequency Response Superposition for Machine Tool State Recognition [In preparation].
- **Lee, H.**, Han, C., Gabor, T., Sim, Y., Akin, S., Jun, M., & Lee, J.* (2025). Manufacturable Physically Unclonable Identifiers via Cold Spray: A Full-Stack Framework with Implicit Neural Representation for Scalable Product Authentication. Journal of Manufacturing Systems [Under review].
- Kim, E., **Lee, H.**, Sim, Y., Lee, J., & Jun, M.* (2025). Overcoming Sparse Run-to-Failure Data Challenges in Manufacturing: A Contrastive Mixer Framework for Remaining Useful Life Prediction. CIRP Annals – Manufacturing Technology.
- **Lee, H.**, Sim, Y., Han, C., Jun, M., & Lee, J.* (2025). GRAVITON: Generalized Resampling Algorithm for Visual Inference in Target Object Localization. Computers in Industry [Under review].
- Han, C., Gabor, T., **Lee, H.**, Lee, J., Akin, S., & Jun, M.* (2025). Pulsed Cold Spray System for Physical Unclonable Function Generation. Procedia CIRP.
- Jeon, J., Sim, Y., **Lee, H.**, Han, C., Yun, D., Kim, E., Nagendra, S. L., Jun, M., Kim, Y., Lee, S., & Lee, J.* (2025). ChatCNC: Conversational Machine Monitoring via Large Language Model and Real-Time Data Retrieval Augmented Generation. Journal of Manufacturing Systems, 79, 504-514.
- **Lee, H.***, Toner, T., Tilbury, D., & Barton, K. (2025). GraspMixer: Hybrid of Contact Surface Sampling and Grasp Feature Mixing for Grasp Synthesis. IEEE Transactions on Automation Science and Engineering.
- Lee, J., Akin, S.*, Sim, Y., **Lee, H.**, Kim, E., Nam, J., Song, K., & Jun, M.* (2024). A stethoscope-guided interpretable deep learning framework for powder flow diagnosis in cold spray additive manufacturing. Manufacturing Letters.

- Han, C., Lee, J., **Lee, H.**, Sim, Y., Jeon, J., & Jun, M.* (2024). Zero-shot Autonomous Robot Manipulation via Natural Language. Manufacturing Letters, 42, 16-20.
- **Lee, H.***, Toner, T., Tilbury, D., & Barton, K. (2022). Multi-sensor aided deep pose tracking. IFAC-PapersOnLine, 55(37), 326-332.

## CONFERENCE PROCEEDINGS & PRESETNATIONS

**‡: Presenter** ***: Corresponding author**

- Han, C.‡, Sim, Y., Jung, H., Lee, J., **Lee, H.**, Kang, Y., Woo, S., Kim, G., Park, H., & Jun, M.* (2025, December 2-7). IMPACT: Industrial Machine Perception via Acoustic Cognitive Transformer. Conference on Neural Information Processing Systems 2025: San Diego, CA, United States [Under review].
- **Lee, H.‡***, Sim, Y., Han, C., Lee, J., Bera, A., & Jun, M. (2025, October 19-25). EASEIR: Efficient and Adaptive Safe-set Estimation via Implicit Representation for High-dimensional Motion Planning. IEEE/RSJ Conference on Intelligent Robots and Systems 2025: Hangzhou, China [Under review].
- Kim, E., **Lee, H.**, Sim, Y., Lee, J., & Jun, M.‡* (2025, August 17-23). Overcoming Sparse Run-to-Failure Data Challenges in Manufacturing: A Contrastive Mixer Framework for Remaining Useful Life Prediction. 74th CIRP Annals – Manufacturing Technology: Stockholm, Sweden.
- Sim, Y.‡*, Lee, J., **Lee, H.**, Han, C., Lee, H., & Jun, M. (2025, August 17-20). I2DTM: Immersive and Interactive Digital Twin Metaverse Framework. International Design Engineering Technical Conference & Computers and Information in Engineering Conference 2025: Anaheim, CA, United States [Under review].
- Sim, Y.‡*, Lee, J., **Lee, H.**, Yun, D., Myeong, N., Hwang, Y., Park, H., Jun, M., & Kim, E. (2025, June 23-27). Sound Data Augmentation Using Frequency Response Superposition for Machine Tool State Recognition. International Manufacturing Science and Engineering Conference 2025: Greenville, NC, United States.
- **Lee, H.‡***, Choi, Y., Lugo, E., Lee, J., Lee, S., & Jun, M. (2025, June 23-27). GMGP: Generalized Model for Grasp Planning of Vacuum and Parallel Jaw Grippers. International Manufacturing Science and Engineering Conference 2025: Greenville, NC, United States.
- Han, C.‡, Gabor, T., **Lee, H.**, Lee, J., Akin, S., & Jun, M.* (2025, June 1-4). Pulsed Cold Spray System for Physical Unclonable Function Generation. CIRP International Symposium on Electro Physical and Chemical Machining (ISEM): Vancouver, BC, Canada.
- Jun, M.‡*, Lee, J., Kim, E., Sim, Y., Han, C., & **Lee, H.** "Generalized and Generative AI for Smart Manufacturing" Presented at International Conference on Precision Engineering and Sustainable Manufacturing, July 2024
- Han, C.‡, **Lee, H.**, Lee, J., & Yun, H.* (2024, June 17-21). Digital Twins for Autonomous CNC Equipment Operation. International Manufacturing Science and Engineering Conference 2024: Knoxville, TN, United States.
- **Lee, H.‡***, Toner, T., Tilbury, D., & Barton, K. Multi-sensor aided deep pose tracking. (2022, October 2-5). Modeling, Estimation and Control Conference: Jersey City, NJ, United States.

## POSTER SESSIONS

- Sim, Y., Lee, J., **Lee, H.**, Yun, D., Myeong, N., Hwang, Y., Park, H., Jun, M., & Kim, E. "Sound Data Augmentation Using Frequency Response Superposition for Machine Tool State Recognition." Presented at Manufacturing And Materials Research Laboratories Symposium, December 2024
- Lee, J., Jeon, J., Sim, Y., **Lee, H.**, Han, C., Yun, D., & Jun, M. "Generative AI Based Real-Time Human-Data Interaction for Smart Manufacturing" Presented at Digital Twin for Manufacturing Sustainability, Safety, and Resilience, October 2024
- **Lee, H.**, Sim, Y., Lee, J., Han, C., & Jun, M. "Digital Twin & Vision Guided Autonomous Robotic Path

Planning" Presented at Digital Twin for Manufacturing Sustainability, Safety, and Resilience, October 2024

- Lee, J., Kim, E., Han, C., **Lee, H.**, & Sim, Y. "Generalized and Generative Smart Manufacturing" Presented at North Academy of Engineering Regional Meeting, March 2024
- Han, C., **Lee, H.**, & Jun, M. "Robotics in Smart Manufacturing" Presented at Congressional Artificial Intelligence Caucus, May 2024
- **Lee, H.** & Toner, T. "Multi-sensor aided deep pose tracking." Presented at Toyota HSR Community in North America Meeting 3, May 2022

## FELLOWSHIPS

- Winkelman Fellowship *2023 - 2024*
- Multidisciplinary Design Program (MDP) Summer Fellowship *2021 - 2021*

## OTHER HONORS & AWARDS

- Italian Technology Award 2025 *N/A*
- Young Professional NET Award 2025 *N/A*
- NSF Travel Award for NAMRC/MSEC 2025 *N/A*
- DigiTwin 2024 for Manufacturing, Sustainability, Safety, and Resilience Student Best Poster Award *N/A*
- Young Professional NET Award 2024 *N/A*
- MECC 2023 Travel Grant *N/A*

## PATENTS

- Jun, M., Lee, J., **Lee, H.**, Akin, S., Han, C., Gabor, T., & Sim, Y. "Cold Spray-Enabled Physically Unclonable Identifier and its Spectral Authentication via Implicit Neural Representation." U.S. Patent. [Under review]

## INDUSTRIAL PROJECTS

- BCI Solution, Inc *2024 - 2025*
  - Developed a digital twin of FANUC CRX-10iA/L using MuJoCo physics simulator and Python
  - Established bi-directional communication among FANUC CRX-10iA, its digital twin, and CESMII platform for automation and verification of core-making operations
- Korea Institute of Machinery and Materials (KIMM) *2024 - Present*
  - Developed a generalized sampling algorithm to extend a cutting edge object segmentation AI to 6-DOF object pose estimation method for machine tending
  - Developed a hybrid computer vision pipeline to localize metal debris inside CNC machine that must be removed
- BCI Solution, Inc *2023 - Present*
  - Developed a model predictive control (MPC) algorithm using Python to plan a path for FANUC CRX-25iA to apply sealant on target locations
  - Built a server-client system using Python and KAREL to communicate FANUC controller using external PC
- Terra Drive Systems (TDS) *2023 - 2023*
  - Installation of stethoscope-based sound sensor and mini PC to establish a data pipeline
  - Developed a sound recognition AI model to monitor status of Makino a81 CNC machine
  - Generated a web-based dashboard for intuitive data analysis and visualization

## PROFESSION SOCIETY MEMBERSHIPS

- Korean-American Scientists and Engineers Association (KSEA) / Member *2024 - Present*
- Graduate Association for Manufacturing Excellence / Treasurer *2025 - Present*

## MINI PROJECTS

- Robot-Camera Pose Tracking *2022 - 2022*
  - Preprocessed and trained Keypoint-RCNN using PyTorch to track and visualize all joint positions of Franka Emika Panda in RGB images
  - Integrated forward kinematics, Perspective-n-Point algorithm, and camera intrinsic matrix to estimate camera poses with respect to the robot's base
- Picking & Sorting (5-DOF Robotic Arm) *2021 - 2022*
  - Utilized OpenCV to detect blocks using LiDAR Camera L515 (Intel RealSense)
  - Implemented forward and inverse kinematics of a robot manipulator for toy block picking, sorting, and stacking
- SLAM (Differential Wheeled Robot) *2021 - 2021*
  - Embedded fractions of particle filter algorithm in C for localization and mapping using LiDAR sensor
  - Generated A* search path planning algorithm in C to automatically explore unknown environments
  - Constructed a control strategy in C to integrate several sensors to make the robot follow the planned path
- Adaptive Yaw Rate Controller Design *2020 - 2020*
  - Explored methods to obtain an optimal performance for vehicle system parameter estimation
  - Designed a controller using Indirect Model Reference Adaptive Control (IMRAC)
  - Simulated the performance of the controller under noise, disturbance, and model uncertainties using Simulink
- Line Tracking Robot *2019 - 2019*
  - Designed PI controller using LabVIEW and MATLAB to control 2 motors under a robot
  - Utilized infrared line tracking sensor as a part of feedback system for stabilizing the robot control
- MOTHERSHIP (Serpentine Rescue Robot) *2015 - 2016*
  - Analyzed structural failures in articulators of a serpentine robot during its operation
  - Explored alternative structures, mechanisms, and materials to prevent cracking in the joints

## LEADERSHIP & MENTORSHIP

- Undergraduate Student Mentor *2024 - Present*
  - Richard Li (Summer 2024), Evin Lugo (Fall 2024 - Present), Yoonseo Lee (Spring 2025 - Present)
- Sub-Team Leader (Barton Research Group) *2021 - 2022*
  - Facilitated communication among 5 sub-team members and Ph.D. mentors
  - Led weekly team meetings for discussion among members and provided advice regarding their projects
  - Helped the members to view their individual works in a broader aspect and tied them together
- Squad Leader (Republic of Korea Army) *2016 - 2018*
  - Trained artillery specialty to new members and helped them understand their duty in a team
  - Fostered cohesion among members by discussing and reminding them about team goals

## CERTIFICATIONS

- Deep Learning Specialization, DeepLearning.AI
- Modern Robotics, Northwestern University

## SKILLS

- **Programming:** C/C++ (Beginner), Python (Professional), MATLAB (Professional)
- **Development:** Linux, Git, Visual Studio Code, Fusion 360
- **Frameworks/Libraries:** ROS, PyTorch, TensorFlow, OpenCV, Open3D, Arduino
- **Languages:** English (bilingual), Korean (native), Japanese (conversational)