

# Curriculum Vitae (Hanjun Kim)

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## Education

**Georgia Institute of Technology** (Atlanta, GA) Jul. 2022 – Present  
Doctor of Philosophy in *Mechanical Engineering* (GPA: 4.00/4.00)

- Advisor: Dr. Aaron Young
- Research Topic: Intelligent Control of Robotic Lower-Limb Prostheses

**Purdue University** (West Lafayette, IN) Jul. 2017 – Jul. 2019  
Master of Science in *Mechanical Engineering* (GPA: 3.71/4.00)

- Advisor: Dr. Martin B.G. Jun
- Thesis: Machine Anomaly Detection using Sound Spectrogram Images and Neural Networks

**Korea Military Academy** (Seoul, Korea) Feb. 2010 – Feb. 2014  
Bachelor of Science in *Operations Research* (GPA: 3.91/4.30)

- Advisor: Dr. Won-woo Lee

## Research Experience

**Georgia Institute of Technology** (Atlanta, GA) Jul. 2022 – Now  
*Graduate Research Assistant*

### **Design of intelligent control algorithms for lower-limb prostheses**

- Developing estimation algorithms to evaluate user behavior (e.g., joint moments, works, and walking terrain slopes) in real time using multiple sensors embedded in a robotic prosthesis and AI techniques.
- Modeling biomimetic control parameters for lower limb prostheses replicating human biomechanics of knee and ankle joints across various environments and gait states.
- Developing a self-learning system to optimize a prosthesis to each person's behavior, thereby unloading energy expenditures and improving performance.

### **Design of wearable robot frameworks using ROS**

- Developed inter-device remote communication systems based on ROS2 (Robot Operating System) for unifying real-time joint dynamics from multiple lower limb joints (hips, knees, ankles)
- Developing real-time actuator command systems driven by AI-based human intent recognition using Jetson Orin.

**Defense Agency for Technology and Quality (Seoul, Korea)**

Jul. 2020 – Jul. 2022

*Research Officer*

**Organization of a long-term acquisition plan for the FSS (Force Support System)**

- Conducted a preliminary study to procure the HPS (Hearing Protection System) for soldiers based on ANSI S12.42, ANSI S3.19, and ISO 4869-2.
- Benchmarked the US ARL (Army Research Laboratory) to set up environments to test sound attenuations against firearm noises using dummy heads.

**Purdue LAMM (West Lafayette, IN)**

Aug. 2017 – Jul. 2019

*MS Research Assistant*

**Design of a machine health monitoring system using sound spectrogram images and neural networks (Master's Thesis topic).**

- Developed a stethoscope-based sound sensor to acquire clear sound signals by minimizing external noises.
- Designed an autoencoder-based anomaly detection strategy for industrial robot arms by training AI models informed by internal sound signals of robot joints.

**Development of smart manufacturing applications for Wabash Heartland Innovation Network (WHIN).**

- Developed a CNN (Convolutional Neural Network) based bearing failure classification framework using NASA prognostics data repository.
- Designed Raspberry Pi-based remote diagnosis systems for rotary machines by training AI models informed by internal sound signals of machining components.

**Development of a spindle monitoring system in the Korea Institute of Machinery & Materials (KIMM) project.**

- Simulated vibration signals from bearing defects in 4 major locations (ball, cage, inner race, and outer race).
- Designed bearing defect classification algorithm by extracting statistical features (e.g., RMS and kurtosis) from bearing vibration and by utilizing supervised neural network architectures.

## Contributed Publications

1. S. Zhou, **H. Kim**, J. Y. Maldonado-Contreras, A. O. Sverrisson, D. Langlois, K. R. Herrin, and A. J. Young, "An Anthropometry-Based Personalization of Powered Knee Prosthesis for Metabolic Efficiency," *IEEE Transactions on Medical Robotics and Bionics*, Vol. 7(2025), no. 3, pp. 1263-1274.
2. S. Zhou, **H. Kim**, J. Y. Maldonado-Contreras, A. O. Sverrisson, D. Langlois, K. Herrin, and A. Young, "Biomechanical and energetic effects of knee flexion control during incline walking for users of the Power Knee," *Clinical Biomechanics*, Vol. 124(2025): 106499.
3. J. Y. Maldonado-Contreras, C. Johnson, S. Zhou, **H. Kim**, I. Knight, K. R. Herrin, and A. J. Young, "Real-Time Adaptation of Deep Learning Walking Speed Estimators Enables Biomimetic Assistance Modulation in an Open-Source Bionic Leg," *IEEE Transactions on Medical Robotics and Bionics*, Vol. 7(2025), no. 2, pp. 711-722.
4. **H. Kim**, D. Lee, J. Y. Maldonado-Contreras, S. Zhou, K. R. Herrin, and A. J. Young, "Mode-unified intent estimation of a robotic prosthesis using deep-learning," *IEEE Robotics and Automation Letters*, Vol. 10(2025), no. 4, pp. 3206-3213.
5. H. Yun\*, **H. Kim**\*, Y. H. Jeong, and M. B. G. Jun (\*: co-first), "Autoencoder-based anomaly detection of industrial robot arm using stethoscope based internal sound sensor," *Journal of Intelligent Manufacturing*(2021). 1-18.
6. **H. Kim**, "Development plan of Hearing Protection System (HPS) for ROK Army Warrior Platform," *Journal of the defense science & technology information*, Volume 103(2021): 14-21.
7. H. Yun, **H. Kim**, E. Kim, and M. B. G. Jun, "Development of internal sound sensor using stethoscope and its applications for machine monitoring," *Procedia Manufacturing*, Volume 48(2020): 1072-1078.
8. **H. Kim**, "Machine anomaly detection using sound spectrogram images and neural networks," Master's Thesis, Purdue University (2019). Retrieved from <https://doi.org/10.25394/PGS.8864375.v1>.
9. W. Lee, H. Wu, H. Yun, **H. Kim**, M. B. G. Jun, and J.W. Sutherland, "Predictive maintenance of machine tool systems using artificial intelligence techniques applied to machine condition data," *Procedia CIRP*, Volume 80(2019): 506-511.
10. **H. Kim**, H. Yun, and M. B. G. Jun, "Simulation of accelerometer sensors for bearing failures in machine tool spindle units," *KSMTE Annual spring conference*, Daejeon, KR, May 2018.

## Conferences

1. J. Y. Maldonado-Contreras, C. Johnson, I. J. Knight, A. Sawant, S. Zhou, **H. Kim**, K. R. Herrin, and A. J. Young, "Transfer Learning for Walking Speed Estimation Across Novel Prosthetic Devices and Populations," *IEEE/RSJ International Conference on Intelligent Robots and System*, Hangzhou, China, Oct 2025 (accepted).
2. **H. Kim**, S. Zhou, J. Shim, K. Herrin, and A. J. Young, "Mode-Unified Strategy for Continuous Control of Knee-ankle Prostheses," *International Consortium for Rehabilitation Robotics*, Chicago, IL, USA, May 2025.
3. **H. Kim** and A. J. Young, "User-independent, mode-unified intent recognition of a powered knee-ankle prosthesis using deep learning," *American Society of Biomechanics*, Madison, WI, USA, Aug 2024.  
\* Selected as one of three Clinical Biomechanics Award Finalist
4. **H. Kim**, H. Yun, and M. B. G. Jun, "Autoencoder based machine learning using audio spectrogram for smart manufacturing," *US-Korea Conference on Smart Science, Engineering and Health for Livable Communities*, Chicago, IL, USA, Aug 2019.
5. H. Yun, **H. Kim**, and M. B. G. Jun, "Machine Health Monitoring and Visualization for Smart Manufacturing," *US-Korea Conference on Science, Technology, and Entrepreneurship*, Queens, NY, USA, Aug 2018.

## Patent

US Patent 11475910, "System and methods for machine anomaly detection based on sound spectrogram images and neural networks," (Inventors: M. B. G. Jun and **H. Kim**)

## Special Experience

### EPIC VIP Prosthesis Team (Atlanta, GA)

*Graduate Mentor*

*Aug. 2022 – Now*

- Led projects for developing user state estimators using the TCN (Temporal Convolutional Network) architecture.
- Led ROS-based hardware development project, including multi-channel sensor augmentation and inter-platform communication.
- Organized experimental schedules with other graduate mentors and mentees.

## **ROK Army 2<sup>nd</sup> Corps (Gangwon-do, Korea)**

*Information & Operations Officer*

Jun. 2015 – Dec. 2016

- Analyzed the offensive threat level of the enemy's air force and managed operational plans of the 2nd Corps air defense battalion.

*Platoon Leader*

Jun. 2014 – Jun. 2015

- Detached to the front-line of South Korea and executed missions to protect the area of operation from the air raid of invaders by leading special force units.

## **Korea Military Academy (Seoul, Korea)**

*Basic Military Training Instructor (Senior)*

Nov. 2012 – Mar. 2013

- Provided basic military education to 50 prospective freshmen cadets.

*Flagbearer cadet (Sophomore)*

Jul. 2011 – Feb. 2012

- Provided basic military education to 50 freshmen cadets.
- Led the class cadets to make public decisions and organize events.

## **Awards**

Clinical Biomechanics Award Finalist, ASB 2024

(Title: User-independent, mode-unified intent recognition of a powered knee-ankle prosthesis using deep learning)

## **Scholarships**

NSF SUSMED fellowship

Jan.2025 – Dec.2025

Overseas education scholarship, by Korean Army

Jul. 2022 – Jul. 2025

Overseas education scholarship, by Korean Army

Jul. 2017 – Jul. 2019

## **Skills**

**Programming:** Python, MATLAB, C++, ROS

**Hardware:** Nvidia Jetson, Arduino, Raspberry Pi, Dephy Actpack

**Language:** Korean (Native), English