

Hochul Hwang

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EDUCATION

University of Massachusetts Amherst

Ph.D. student in Computer Science (2nd year)

Amherst, MA

May.2021 - Present

Hanyang University ERICA

B.S. in Robot Engineering, GPA: 3.91 / 4.5 (Cum Laude)

Ansan, Republic of Korea

Mar.2013 - Jun.2019

The University of Texas at Austin

Exchange Program, Electrical and Computer Engineering

Austin, TX

Aug.2017 - May.2018

RESEARCH EXPERIENCE

University of Massachusetts Amherst (Dynamic and Autonomous Robotic Systems Lab)

Amherst, MA

MS-PhD Student / Advisor: Prof. Donghyun Kim

May.2021 - Present

Leading the robotic guide dog development project to support mobility for the visually impaired individuals ([video](#), [news](#))

- Deep learning: Implementing multi-task learning algorithms (e.g., MTAN), simulation data generation in Unreal Engine
- Autonomous navigation: Collaboratively implemented a visual representation learning based path planning algorithm in Go1
- Qualitative research: Interviewed blind or visually impaired people and guide dog trainers; data analysis (open and axial coding)
- Control: Utilized nonlinear optimization solvers (Knitro, IPOPT) for humanoid stand-up simulation
- Hardware: Implemented speech recognition system; designed the harness handle of the robot using CAD

Korea Institute of Science and Technology (Center for Artificial Intelligence)

Seoul, Republic of Korea

Research Intern / Advisor: Dr. Ig-Jae Kim

Sep.2019 - Dec.2020

Developed a real-time human action recognition system with accuracy of 75% (90% in trimmed videos) and published a paper

- Task: Finetuned several deep learning algorithms with synthetic data to enhance action recognition performance (PyTorch)

Ulsan National Institute of Science and Technology (BCI Lab)

Ansan, Republic of Korea

Research Intern / Advisor: Prof. Sung-Phil Kim and Prof. Jeongwoo Sohn

Jul.2019 - Aug.2019

Setup an eye-tracking system for primate brain computer interface (BCI) system and developed MATLAB code for task tools

The University of Texas at Austin (Human Centered Robotics Lab)

Austin, Texas

Research Assistant / Advisor: Prof. Luis Sentis

Sep.2017 - Aug.2018

Participated in the process of developing, testing, and optimizing the 6DOF passive-ankled bipedal humanoid

- Task: Experiment protocol setup, dynamic biped balancing test, simulation data collection, figure generation
- Required skills: State estimation, sensor data analysis obtained from joint encoders, IMU, motion capture, and contact sensor; data plot (Python), simulation (C++), and 3D printing

The University of Texas at Austin (Lu Research Group)

Austin, Texas

Research Assistant / Advisor: Prof. Nanshu Lu

Apr.2018 - Jun.2018

Conducted independent research to measure lower limb prosthetic's inner stress distribution using flexible resistive force sensors

- Task: Resistive force sensor optimization, capacitive force sensor
- Required skills: Resistance/stress data analysis, LabVIEW, Silhouette Studio

Korea Institute of Industrial Technology (Culture Technology R&D Group)

Ansan, Republic of Korea

Research Intern / Advisor: Dr. Sangwon Lee

Dec.2016 - Mar.2017

Supported in two research projects: Ship video recording structure, autonomous stage for K-pop performances

- Task: Closed-chain mechanism (Stewart platform) analysis for ocean simulation (MATLAB) and gimbal system CAD design

PUBLICATIONS

1. **H. Hwang**[†], T. Xia[†], I. Keita, K. Suzuki, J. Biswas, S. I. Lee, and D. Kim, "System Configuration and Navigation of a Guide Dog Robot: Toward Animal Guide Dog-Level Guiding Work", *arXiv preprint, 2022 (submitted to ICRA)*
2. K. H. Ha, W. Zhang, H. Jang, S. Kang, L. Wang, P. Tan, **H. Hwang**, and N. Lu, "Highly Sensitive Capacitive Pressure Sensors over a Wide Pressure Range Enabled by the Hybrid Responses of a Highly Porous Nanocomposite", *Advanced Materials, 2021*
3. **H. Hwang**, C. Jang, G. Park, J. Cho, and I.J. Kim, "ElderSim: A Synthetic Data Generation Platform for Human Action Recognition in Eldercare Applications", *IEEE Access, 2021*

4. D. Kim, S. J. Jorgensen, **H. Hwang**, and L. Sentis, "Control Scheme and Uncertainty Considerations for Dynamic Balancing of Passive-Ankled Biped and Full Humanoids", *IEEE-RAS International Conference on Humanoid Robots (Humanoids)*, 2018
5. D. Kim, J. Lee, O. Campbell, **H. Hwang**, and L. Sentis, "Computationally-Robust and Efficient Prioritized Whole-Body Controller with Contact Constraints", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2018

PATENTS

1. J. Cho, I. J. Kim, and **H. Hwang**, "Human behavior recognition system and method using hierarchical class learning considering safety", *U.S. Patent Application 17/565,453*, 2022

PRESENTATIONS

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| Session Presentation | Institute of Electronics and Information Engineers, Jeju, Republic of Korea |
| "Improving Elderly Action Recognition Performance via Synthetic Data Training" | Aug.19, 2020 |
| <ul style="list-style-type: none"> Validated RGB-based action recognition method by training on additional synthetic data on various experimental settings | |
| Poster Presentation | Clinically Applied Rehabilitation Engineering Research Symposium, Austin, TX |
| "Optimization in Prosthetic Socket Design" | Apr.13, 2018 |
| <ul style="list-style-type: none"> Introduced a method to improve socket designs based on stress distribution data; collaborated with Hanger Clinic | |

HONORS AND AWARDS

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|---|---------------------|
| University of Massachusetts Amherst Fellowship, CICS Jumpstart Fellowship | Sep.2021 - May.2022 |
| STEAM CUP, Creative Technology and Excellence Award | Jun.2017 - Aug.2017 |
| <ul style="list-style-type: none"> Designed a robotic knee brace with CATIA and applied PI controller with Arduino | |
| Hanyang University, Academic Achievement Scholarship | Mar.2017 - Jun.2017 |
| Haksan Foundation, Academic Achievement Scholarship | Sep.2016 - Dec.2016 |
| Futuristic Impressive Useful Display Competition, Finals | Aug.2016 - Sep.2016 |
| <ul style="list-style-type: none"> Presented an idea of a tablet braille device applying carbon nanotube for braille readers | |

PROFESSIONAL EXPERIENCE

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| National Science Foundation Workshop | Dell Medical School, UT, Austin, TX |
| "Smart and Connected Health" | Mar.11 - 14, 2018 |
| <ul style="list-style-type: none"> Participated in development of atrial fibrillation data distinguishing algorithm using MATLAB | |
| Engineer Battalion of the South Korea Army | The 17th Infantry Division of Korea, Incheon, Republic of Korea |
| Driver and repairer of the M9 Armored Combat Earthmover and bulldozer, squad leader | Feb.2014 - Dec.2015 |
| <ul style="list-style-type: none"> Excavated and cleared areas suspected of land mine contamination, 2014 Asian Games & Asian Para-Games national flag bearer | |

SKILLS

Python, C++, PyTorch, TensorFlow, ROS, MATLAB, SOLIDWORKS (Certified SolidWorks Associate), CATIA, Onshape

EXTRACURRICULAR ACTIVITIES

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| Teaching Experience | |
| Teaching assistant | University of Massachusetts Amherst, MA |
| <ul style="list-style-type: none"> Fall 2022: Introduction to Robotics - Mechanics, Dynamics, and Control (COMPSCI 403) | Sep.2022 – Present |
| Student research advisor | University of Massachusetts Amherst, MA |
| <ul style="list-style-type: none"> Advised a MS student to implement a path planning algorithm (from ICRA'22) in GO1 robot Advised two undergraduate students for CAD designing | Jun.2022 – Present
Jan.2021 – May.2022 |
| Missionary Group Teacher | SaRang Community Church, Seoul, Republic of Korea |
| <ul style="list-style-type: none"> Taking care of young adults with intellectual disabilities | Feb.2019 – May.2021 |
| Knowledge factory Makerspace Instructor | Hanyang University, Ansan, Republic of Korea |
| <ul style="list-style-type: none"> Taught 3D printing process to undergraduate students | Mar.2017 - May.2017 |
| Leadership | |
| UMass Korean Graduate Student Association (KGSA) President | Amherst, MA
May.2022- Present |
| <ul style="list-style-type: none"> Organized job recruiting and social events as a leader of a group of 300 members | |