

Hochul Hwang

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EDUCATION

University of Massachusetts Amherst

M.S./Ph.D. in Computer Science

Amherst, MA

May.2021 - Present

Hanyang University

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](#))

- Qualitative research: Interviewed blind or visually impaired people and guide dog trainers; data analysis (open and axial coding)
- Perception: Implementing existing multi-task learning algorithms (e.g., MTAN), data collection and annotation
- Autonomous navigation: Collaboratively implemented a visual representation learning based path planning algorithm
- Control: Utilized nonlinear optimization solvers (Knitro, IPOPT) for humanoid (simplified dynamics) stand up simulation (Unity)
- Hardware: Implemented speech recognition system; designed the harness handle of the robot via 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 & Sungkyunkwan University (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. 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
2. **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
3. 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

4. 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

PRESENTATIONS

Session Presentation Institute of Electronics and Information Engineers, Jeju, Republic of Korea
"Improving Elderly Action Recognition Performance via Synthetic Data Training" Aug.19, 2020
• 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
• Introduced a method to improve socket designs based on stress distribution data; collaborated with Hanger Clinic

HONORS AND AWARDS

University of Massachusetts Amherst, CICS Jumpstart Fellowship Sep.2021 - May.2022

STEAM Open Embedded Contest, Creative Technology and Excellence Award Jun.2017 - Aug.2017
• Designed a robotic knee brace with CATIA and applied PI controller with Arduino

Hanyang University Scholarship, Academic Achievement Mar.2017 - Jun.2017

Haksan Foundation Scholarship, Academic Achievement Sep.2016 - Dec.2016

Futuristic Impressive Useful Display Competition, Finals Aug.2016 - Sep.2016
• Presented an idea of a tablet braille device applying carbon nanotube for braille readers

PROFESSIONAL EXPERIENCE

National Science Foundation Workshop Dell Medical School, UT, Austin, TX
"Smart and Connected Health" Mar.11 - 14, 2018
• 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
• Excavated and cleared areas suspected of land mine contamination, 2014 Asian Games & Asian Para-Games national flag bearer

SKILLS

Computing Ability
Python, C++, PyTorch, TensorFlow, Linux, ROS, MATLAB, LaTeX

Computer-Aided Design Software
SOLIDWORKS (Certified SolidWorks Associate), CATIA, Onshape, Blender

EXTRACURRICULAR ACTIVITIES

Teaching Experience

Student research advisor University of Massachusetts Amherst, MA
• Advised a MS student to implement a path planning algorithm (from ICRA'22) in existing robot platform Jun.2022 – Sep.2022
• Advised CAD designing (harness handle, weight loading sys., treadmill speed measurement sys.) Jan.2021 – May.2022

Missionary Group Teacher SaRang Community Church, Seoul, Republic of Korea
• Taking care of young adults with intellectual disabilities Feb.2019 – May.2021

Knowledge factory Makerspace Instructor Hanyang University, Ansan, Republic of Korea
• Taught 3D printing process to undergraduate students Mar.2017 - May.2017

Hanmille International Mentor Hanyang University, Ansan, Republic of Korea
• Assisted two international engineering students with coursework and living Aug.2016 - Dec.2016

Leadership Amherst, MA
UMass Korean Graduate Student Association (KGSA) Leader May.2022- Present
• Organized job recruiting and social events as a leader of a group of 300 members

Robotics Engineering Soccer Club Hanyang University, Ansan, Republic of Korea
Team Captain May.2013 - May.2014