Hochul Hwang

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EDUCATION

University of Massachusetts Amherst — Amherst, MA
Ph.D. student in Computer Science (2nd year) — May.2021 - Present

Hanyang University — Ansan, Republic of Korea
B.S. in Robot Engineering, GPA: 3.91 / 4.5 (Cum Laude) — Mar.2013 - Jun.2019

The University of Texas at Austin — Austin, TX
Exchange Program, Electrical and Computer Engineering — 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 & 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. **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 Bipeds 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

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 Fellowship, 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

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

EXTRACURRICULAR ACTIVITIES

Teaching Experience
Teaching assistant University of Massachusetts Amherst, MA
- Fall 2022: Introduction to Robotics - Mechanics, Dynamics, and Control (COMPSCI 403) Sep.2022 – Present

Student research advisor University of Massachusetts Amherst, MA
- Advised a MS student to implement a path planning algorithm (from ICRA'22) in GO1 robot Jun.2022 – Present
- Advised two undergraduate students for CAD designing 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

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