HAEDO CHO

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EDUCATION

Harvard University Sep. 2020 - Aug. 2026 (Anticipated)
Ph.D., in Mechanical Engineering
Thesis Advisor: Professor Patrick Slade

Korea Advanced Institute of Science and Technology Sep. 2014 - Aug. 2016
M.S., in Mechanical Engineering
Thesis Advisor: Professor Jung Kim
Thesis: *Design of an optical soft sensor for measuring fingertip force and contact recognition*

Inha University, Incheon, Korea Mar. 2008 - Aug. 2014
B.S with Honors, *Summa Cum Laude*, Mechanical Engineering
Thesis Advisor: Professor Sang-kwon Lee

RESEARCH EXPERIENCE

Harvard University, Slade lab
Graduate researcher with Prof. Patrick Slade Jan. 2023 - current

- **Accurate estimation of real-world Energy expenditure using a smartphone**
  - Developed a bio-mechanically inspired data-driven model to estimate energy expenditure using a smartphone.
  - Designed and executed Harvard IRB approved human subjects research targeting real-world physical activities.

Harvard University, Biodesign lab
Graduate researcher with Prof. Conor Walsh Sep. 2020 - Jun. 2022

- **IMU-based tracking system for strength training**
  - Developed a portable embedded Linux system with real-time wireless capabilities using Beaglebone hardware and related data pipeline code (C++).
  - Developed a multi-class exercise classification and motion trajectory estimation model using an LSTM network (with classification accuracy above 98%) trained on IMU data.

Research Fellow with Prof. Conor. J. Walsh Jan. 2019 - Aug. 2020

- **Soft wearable robot for assisting the shoulder of industrial workers**
  - Developed a textile-based wearable pressure array for torque estimation and related digital capacitance readout circuits.

Korea Advanced Institute of Science and Technology (KAIST), Biorobotics lab
Graduate researcher with Prof. Jung Kim Sep. 2014 - Aug. 2016

- **Skin-mountable stretch sensing via piezoresistive material based sensor and hysteresis compensation** [link]
  - Developed a skin-mountable soft stretch sensor using 3D printing technique.
  - Designed and conducted human subjects experiments (+3 subjects) to estimate multi-axis joint motion.
- **Cable-driven soft exo glove with optical soft sensor** [link]
  - Develoed a soft sensor for measuring fingertip force that is based on the optical sensing technique of light intensity modulation.

– Incorporated the sensor into a soft cable-driven glove to augment human performance.

INDUSTRY EXPERIENCE

Wurq Inc.
Signal Processing Engineer (Part-time) July 2022 – May 2023

- **AI-powered fitness technology company**
  - Developed, implemented, and field-tested fitness tracking algorithms.
  - Managed and analyzed biometric data from wearable devices.
  - Developed AI models for activity recognition and health tracking.
  - Designed strength training validation metrics based on biomechanics principles.

Beflex Inc.
Senior researcher Sep. 2016 - Feb. 2018

- **Biometric data-based personal healthcare company**
  - Established an experimental test platform (motion capture system) and analyzed biomechanical data to understand personalized metrics for marathon runners.
  - Developed a test prototype using a portable microcontroller (Raspberry Pi Zero) and evaluated the data processing algorithm.

PATENTS

WO2024151781A1, "Methods and systems for activity detection and quantification of movement kinematics", 18 July 2024.
Inventors: D. Popov, C.J. Walsh, D. Kim, **H. Cho**, F. Bertacchi.

PUBLICATION

Journal publications

[J6] **Haedo Cho**, Patrick Slade. A smartphone-based system for accurately estimating energy expenditure during real-world physical activity. *Nature Computational Science*, under review (2025).

[J5] Daekyum Kim, Yichu Jin*, **Haedo Cho***, Truman Jones, Yu Meng Zhou, Ameneh Fadaie, Dmitry Popov, Krithika Swaminathan, Conor J. Walsh. Learning-based 3D human kinematics estimation using behavioral constraints from activity classification. *Nature Communications*, 16(1), 2025.
*These authors contributed equally.

[J4] Zhou, Y.M., Hohimer, C.J., Young, H.T., McCann, C.M., Pont-Esteban, D., Civici, U.S., Jin, Y., Murphy, P., Wagner, D., Cole, T., Phipps, N., **Haedo Cho**, et al. A portable inflatable soft wearable robot to assist the shoulder during industrial work. *Science Robotics*, 9(91), 2024.

[J3] Hyosang Lee*, **Haedo Cho***, Sangjoon J. Kim, Yeongjin Kim, Jung Kim. Dispenser printing of piezo-resistive nanocomposite on woven elastic fabric and hysteresis compensation for skin-mountable stretch sensing. *Smart Materials and Structures*, 27, 2018.
*These authors contributed equally.

[J2] **Haedo Cho**, Hyosang Lee, Yeongjin Kim, Jung Kim. Design of an optical soft sensor for measuring fingertip force and contact recognition. *International Journal of Control, Automation and Systems*, 15(1), 16-24, 2017.

[J1] Hyosang Lee, Donguk Kwon, **Haedo Cho**, Inkyu Park, Jung Kim. Soft nanocomposite based multi-point, multi-directional strain mapping sensor using anisotropic electrical impedance tomography. *Scientific Reports*, 7:39837, 2017.

Conference publications

[C1] Hyosang Lee, **Jiseung Cho***, Jung Kim, Printable skin adhesive stretch sensor for measuring multi-axis human

joint angles", *IEEE International Conference on Robotics and Automation (ICRA)*,4975 - 4980, 2016 (***This paper was published before I legally changed my name**)

[C2] Yichu Jin, Christina M. Glover, **Haedo Cho**, Oluwaseun A. Araromi, Moritz A. Graule, Na Li, Robert Wood, Conor J. Walsh, Soft Sensing Shirt for Shoulder Kinematics Estimation", *IEEE International Conference on Robotics and Automation (ICRA)*, 2020

TEACHING EXPERIENCE

Biomechanics of Movement and Assistive Robotics (Harvard BE124) Sep. 2024 - Dec. 2023
Teaching Fellow

- Undergraduate/Graduate-level, 4 credits, 30 students
- Lectured in lab sessions on Inverse Dynamics, consulted on students' final projects, and assisted students during office hours.

Data Science 2: Advanced topics in to Data Science (Harvard CS109B/AC209B) Jan. 2023 - May. 2023
Teaching Fellow

- Graduate-level, 4 credits, 180 students
- Lectured in lab sessions on Gap statistics, prepared lecture slides and problem sets, graded assignments and assisted students through office hours

Data Science 1: Introduction to Data Science (Harvard CS109A/AC209A) Sep. 2022 - Dec. 2022
Teaching Fellow

- Graduate-level, 4 credits, 303 students
- Lectured lab session, assisted mid-term final exams led office hours

Introduction to Robotics (Harvard ES159/259) Jul. 2022 - Dec. 2022
Teaching Fellow

- Undergraduate/Graduate-level, 4 credits, 11 students
- Developed course materials (lecture notes and assignments), graded assignments and assisted students through office hours

Technology Venture Immersion (Harvard MS/MBA program) Oct. 2021 - Jan. 2022
Teaching Fellow

- Developed course materials for an introduction to IoT-based embedded systems using Arduino
- Advised Harvard MBA students on human-centered design project development

MENTORING

Truman Jones. Harvard AB in Biomedical Engineering Feb. 2022 - Aug. 2022

- Mentored student on an independent project to fulfill engineering degree requirements
- Assisted student through numerous rounds of Harvard Research Funding Program (HCRP) application

HONORS AND AWARDS

Dean's Competitive Fund for Promising Scholarship Sep. 2023 - Aug. 2024
Harvard University

Korean Governmental Scholarship Sep. 2014 - Aug. 2016
Ministry of Education, Science and Technology, Korea

Hanjin scholarship Mar. 2013 - Aug. 2014
Inha University, Korea

Undergraduate Scholarship Mar. 2008 - Aug. 2012
Inha University, Korea

LEADERSHIP & SOCIAL ACTIVITIES

Habitat for Humanity program Jul. 2013 - Jul. 2013
Team Leader

- Worked on a Habitat construction site and joined the education program for local kids

Republic of Korea Marine Corps Mar. 2009 - Jan. 2011
Platoon Leader

- Mandatory military service for 2 years

HARVARD/ MIT COURSEWORK

Decision Theory	A-
Data Science 1: Introduction to Data Sciences	A
Special Topics in Engineering and Sciences	A
Introduction to Probability	A-
Data Science 2: Advanced Topics in Data Science	A
Analysis and Design of Feedback Control Systems (MIT 2.140)	A
Laboratory Electronics - Analog Circuits	B+

TECHNICAL SKILLS

Programming	Python, C/C++
Frameworks/Packages	Pytorch, Tensorflow, scikit-learn, Pandas, MATLAB
Motion capture system	Qualisys, Cortex (Motion analysis)
3D modeling tool	Solidworks, Fusion360
Graphic tools & others	Adobe Illustrator, Inkscape, MS office, Latex, CorelDRAW

LANGUAGES

Korean *Native Speaker*
English *Fluent*

REFERENCES

Prof. Patrick Slade
Assistant Professor, Engineering and Applied Sciences, **Harvard University**
Boston, MA, 02134, USA
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Prof. Pavlos Protopapas
Professor, Institute for Applied Computational Science (IACS), **Harvard University**
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Prof. Jung Kim
Professor, Department of Mechanical Engineering, **KAIST**
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