Jaeyoun Choi

MA, United States

(+82) 10-9160-6052 cjy0051@mit.edu https://sites.google.com/snu.ac.kr/jaeyoun-choi/

Research Interests

Reinforcement Learning, Robot Learning, Locomotion

Education

Massachusetts Institute of Technology Sep. 2024 –
Ph.D. in Mechanical Engineering *MA, United States*
Advisor: Professor Pulkit Agrawal

Seoul National University Mar. 2021 – Feb. 2023
M.S. in Mechanical Engineering *Seoul, Republic of Korea*
Advisor: Professor Yong-Lae Park

Seoul National University Mar. 2014 – Aug. 2020
B.S. in Mechanical Engineering *Seoul, Republic of Korea*
Summa Cum Laude
Leave of absence for military service (Dec. 2014 – Nov. 2016)

Publications

- **Choi, J.**, Kim, J., Kim, H., Choi, Y. Y., Kim, J. & Ahn, J. Estimation of Pulmonary Oxygen Uptake (VO2) and Carbon Dioxide Production (VCO2) via Deep Learning based on Transfer Learning (In preparation)
- **Choi, J.**, Choi, I., Yoon, S. J., & Park, Y. L. Inertia-Driven Swimming Robot with Agile Maneuvers Inspired by the C-start Motion (In preparation)
- Kim, J. I., **Choi, J. (co-first author)**, Kim, J., Song, J., Park, J., & Park, Y. L. Bilateral Back Extensor Exosuit for multidimensional assistance and prevention of spinal injuries, *Science Robotics,* 9.
- Kim, J. I., **Choi, J. (co-first author)**, Kim, J., & Park, Y. L. (2021). A Twisted Elastic Rotary-Rail Actuator (TERRA) Using a Double-Stranded Helix Structure. *IEEE Robotics and Automation Letters*, *6*(4), 7381-7388. **The contents of this paper were also selected by the IROS'21 Program Committee for presentation at the Conference**
- Kwon, J., Park, M., **Choi, J.**, & Park, Y. L. (2021). Pop-up cookie molds: self-folding elastomer sheets using thermal expansion of embedded air chambers. *Smart Materials and Structures*, *30*(11), 115013

Presentation

- **Choi, J.**, Kim, J. I., Kim, J., & Park, Y. L. Design and Modeling of a Twisted Elastic Rotary-Rail Actuator (TERRA), IROS 2022, Workshop: Assistive robots in the real world
- **Choi, J.**, Lee, T., Kim, Y., Yun, S. S., Jung, B. K., & Cho, K. J. Development of Soft Wearable Robot for Rehabilitation after Rotator Cuff Reconstruction Surgery, Undergraduate Design Competition, Rehabilitation Engineering and Assistive Technology Society of Korea, November 8, 2019

Research Experience

Improbable AI Lab, Massachusetts Institute of Technology Sep. 2024 - Present

Advisor: Professor Pulkit Agrawal & Professor Kevin Chen

Development of dielectric elastomer actuator for legged robot.

- Design an cm scale dielectric elastomer actuator suitable for legged robot.
- Simulate and Control the actuator based on reinforcement learning.

Soft Robotics & Bionics Laboratory, Seoul National University Sep. 2018 – Feb. 2023

Advisor: Professor Yong-Lae Park

Inertia-Driven Swimming Robot with Agile Maneuvers Inspired by the C-start Motion

- Designed an inertia-driven swimming robot mimicking the C-start maneuvers of fish.
- Integrated a LiDAR sensor into the swimming robot, enabling it to recognize and rapidly avoid approaching obstacles.

Soft Ankle Exoskeleton for Multi-Functional Gait Rehabilitation

- Verified the effect of the proposed exoskeleton using the musculoskeletal predictive simulation (SCONE).

Design and Validation of a Spinal Lifting Device: Bilateral Back Extensors Exosuit (BBEX).

- Collaborated with Biomechanics Laboratory (P.I.: Prof. Jaebum Park) at Seoul National University
- Developed a wearable robot that assists various lifting tasks and enhances spinal safety
- Verified the BBEX with human subject experiment and musculoskeletal analysis using OpenSim
- Theoretically analyzed that the BBEX has the potential to reduce risk factors of back injuries.

A Twisted Elastic Rotary-Rail Actuator (TERRA) Using a Double-Stranded Helix Structure

- Designed a linear actuator that has inherent compliance.
- Derived the theoretical model of the developed actuator and analyzed the characteristics of the actuator.

Pop-up cookie molds: self-folding elastomer sheets using thermal expansion of embedded air chambers

- Manufactured the self-folding elastomer sheets by using polymer molding and CNC machining
- Conducted tensile tests and baking experiments to analyze the repeatability of the polymer

Biorobotics Laboratory, Seoul National University May. 2019 – Jan.2020

Advisor: Professor Kyu-Jin Cho

Development of a Wearable CPM Device for Rehabilitation after Rotator-Cuff Repair Surgery

- Designed a rehabilitation robot consisting of a foldable pneumatic actuator and its anchoring mechanism
- Verified that the robot can conduct shoulder flexion without discomfort

Work Experience

Neumafit Corporation Mar. 2023 - Present

Chief Technical Officer

Estimation of Pulmonary Oxygen Uptake (VO2) and Carbon Dioxide Production (VCO2) via Deep Learning based on Transfer Learning

- Collaborating with Sports Engineering Lab (P.I.: Prof. Jooeun Ahn) at Seoul National University
- Developed deep-learning algorithm based on attention mechanism for VO2 and VCO2 estimation

Patents

- K.R. 10-2022-0083838, “MULTI-DOF WEARABLE ASSISTANCE DEVICE”, Korea, Patent Pending
- K.R. 10-2021-0111235, “FORMING MOLD”, Korea, Patent Pending
- K.R. 1026146220000, “AN ELECTRONIC DEVICE FOR ANALYZING ATHLETIC PERFORMANCE, A METHOD OF OPERATING THE ELECTRONIC DEVICE, AND AN ATHLETIC ANALYSIS SYSTEM INCLUDING THE ELECTRONIC DEVICE”, Korea, Patent Granted
- K.R. 1024827300000, “Twisted Elastic Rotary-Rail Actuator”, Korea, Patent Granted
- K.R. 1022234590000, “APPARATUS FOR REHABILITATION”, Korea, Patent Granted

Honors & Awards

- **Outstanding MS Thesis Paper Award**, Seoul National University — Feb. 2023
- **Outstanding MS Thesis Presentation Award**, Seoul National University — Dec. 2022
- **Summa Cum Laude,** Seoul National University — Aug. 2020
- **Grand Prize**, Undergraduate Design Competition, Rehabilitation Engineering and Assistive Technology Society of Korea — Nov. 2019

Scholarships

- **Human Resources Development Program Fellowship**, Korea Institute for Advancement of Technology — 2021 – 2023
- **Kwanjeong Educational Fellowship**, Kwanjeong Educational Foundation — 2018 – 2020
- **Merit-based Scholarship**, Seoul National University — Spring, 2015
- **Eminence Scholarship**, Seoul National University — Fall, 2014, Fall, 2017

Teaching Experience

- Teaching Assistant, **Mechanical Product Design**, Seoul National University — Spring, 2021
- Tutor, **Fundamental of Physics 2**, Seoul National University — Fall, 2019
- Tutor, **Fundamental of Physics 1**, Seoul National University — Spring, 2019
- Tutor, **Solid Mechanics**, Seoul National University — Spring, 2019

Extracurricular Experience

SNU NanumAkdan — Mar. 2017 – Jul. 2018

Volunteering Band

- Conducted music lessons for children aged 5 to 12 at a social welfare center, focusing on underprivileged families.

SAMSUNG Dream Class — Jun. 2017 – Aug. 2017

Education volunteer program

- Provided mathematics tutoring to middle school students facing limited educational opportunities due to economic challenges.

Skills

- **CAD Design** SolidWorks, Fusion 360
- **Statistics** R, SPSS
- **Analysis & Simulation Software** OpenSim, SCONE, Ansys Fluent
- **Programming Languages** Python, MATLAB, C/C++

- **Software Libraries** PyTorch, ROS
- **Laboratory Tools** EMG (Delsys), Laser Cutting, 3D Printing, Motion Capture (Vicon)