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JEONGHWAN LEE

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PROFESSIONAL SUMMARY

- Highly driven engineer and researcher with 5+ years of experience in interdisciplinary human subject research that requires deep knowledge of following:
  - Biomechanics
  - Signal processing
  - Design optimization
  - Robotics
  - Data science
  - Statistical modeling
- Experience in collaboration with clinicians, and clinical team to identify physiological, muscular, kinematic, and dynamic correlates of post-stroke walking impairments
- Author or co-author of 5+ research articles in fields of mechanism design, biomechanics, computer-aided surgery, and rehabilitation robotics

TECHNICAL SKILLS

Programming	C/C++, Python, MATLAB, R, Mathematica
Design Tools	Solidworks, EAGLE
Engineering Tools	OpenSim, Simulink (real-time), Labview, Multisim
Experimental	Force sensors, IMU, EMG, Motion capture, Wearable metabolic system

PROFESSIONAL & RESERACH EXPERIENCE

University of Texas at Austin   **Sept 2017 — Present**
Graduate Research Assistant   Austin, TX
- Design a light-weight, high-torque robotic hip exoskeleton with a 3-DoF joint motion to examine optimal torque assistance avoiding a spastic response in post-stroke individuals
- Characterize post-stroke stiff-knee gait using unsupervised learning to reveal gait phenotypes with different motor control deficits and contribute phenotype-specific intervention
- Research exoskeleton's weight effect on gait alteration by 40+ human subjects data
- Evaluated 1-DOF linkage designs for single motor-driven robotic gait trainer in terms of kinematic accuracy in comparison to 100+ healthy individuals gait data
- Proposed a numerical optimization-based dimensional synthesis method and a systematical evaluation framework using cross-validation for an unbiased, generalized comparison

Harmonic Bionics, Inc.   **May 2019 — Aug 2019**
System Validation Engineer - Internship   Austin, TX
- Managed system quality of mechatronics and software solutions for EtherCAT motion controller and sensor interface to ensure quality and effectiveness of products; devised hardware debugging tools and quality control frameworks to minimize failure rates

Harmonic Bionics, Inc.   **May 2018 — Aug 2018**
System Validation Engineer - Internship   Austin, TX
- Built a source code library for EtherCAT motion controller and sensor interface to allow users to create their own application solutions
- Designed demonstration kits (e.g., haptics interface) of Esmacat products to exhibit at a tech conference

Korea Institute of Science and Technology (KIST)   **Mar 2017 — July 2017**
Research Assistant   Seoul, KR
- Researched a non-invasive, patient-specific surgical navigation method for an orbital reconstructive surgery, improving registration and tool tracking accuracy by up to 50%

Seoul National University   **Mar 2016 — Feb 2017**
Graduate Research Assistant   Seoul, KR
- Devised a needle steering scheme with a pivoted super-elastic needle made of Nitinol for MR image-guided breast needle intervention robot, improving needle insertion angle and tip movement with zero actuator addition in robot
- Designed a low-cost (< $1K) vehicle mockup with four adjustable parameters for the research to predict human motion in ingress/egress movement using an artificial neural network
- Recruited ten healthy subjects, and collected human subject data including kinematic and kinetic data during vehicle ingress/egress trials

The University of Texas Health Science Center   Sept 2014 — Feb 2016
Research Assistant   Houston, TX
- Designed and prototyped a cable-driven continuum manipulator unit for a minimally invasive surgical robot system

Seoul National University   Sept 2013 — Aug 2014
Graduate Research Assistant   Seoul, KR
- Researched a calibration method of C-arm X-ray machine to develop 2D/3D medical image registration method for a robot-assisted total knee arthroplasty surgery

EDUCATION

Ph.D. candidate in Mechanical Engineering, University of Texas at Austin, Austin, TX   **Expected graduation: Summer 2022**
M.S. in Mechanical Engineering, Seoul National University, Seoul, KR   **2017**
B.S. in Mechanical Engineering, Hanyang University, Seoul, KR   **2013**

SELECTED PUBLICATIONS

[1] **J. Lee**, L. Li, S. Y. Shin, A. D. Deshpande, and J. Sulzer, "Kinematic comparison of single degree-of-freedom robotic gait trainers," *Mechanism and Machine Theory*, vol. 159, p. 104 258, 2021.

[2] **J. Lee**, S. Y. Shin, G. Ghorpade, T. Akbas, and J. Sulzer, "Sensitivity comparison of inertial to optical motion capture during gait: Implications for tracking recovery," in *2019 IEEE 16th International Conference on Rehabilitation Robotics (ICORR)*, 2019, pp. 139–144.

[3] **J. Lee**, K. Mekuria, T. G. Son, W. S. Jeong, J. W. Choi, and Y. Kim, "A novel noninvasive patient-specific navigation method for orbital reconstructive surgery: A phantom study using patient data," *Plastic and reconstructive surgery*, vol. 143, no. 3, 602e–612e, Mar. 2019.

[4] H. Kim, T. G. Son, **J. Lee**, H. A. Kim, H. Cho, W. S. Jeong, J. W. Choi, and Y. Kim, "Three-dimensional orbital wall modeling using paranasal sinus segmentation," *Journal of Cranio-Maxillofacial Surgery*, vol. 47, no. 6, pp. 959–967, 2019.

[5] Y. Kim, E. S. Choi, J. Seo, W. S. Choi, **J. Lee**, and K. Lee, "A novel approach to predicting human ingress motion using an artificial neural network," *Journal of Biomechanics*, vol. 84, pp. 27–35, 2019.