JEONGHWAN LEE

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PROFESSIONAL SUMMARY

- PhD candidate trained in Mechanical Engineering, with 5+ years of experience in medical robotics, biomechanics, and human subject research.
- Proficient in scientific programming, such as kinematics/dynamics analysis, statistical analysis, machine learning, and numerical optimization, using Python, C/C++, R, and MATLAB.
- Skilled in collecting and processing biomechanical and physiological signals (e.g., MoCap, EMG, IMU, indirect calorimetry, and etc.).
- Experience in mechatronic system development and validation.

CORE COMPETENCIES

Kinematics & Dynamics Analysis, Design Optimization, System Validation

Data Mining, Machine Learning, Statistical Modelling

Human Subject Research, Human Locomotion Biomechanics

PROFESSIONAL EXPERIENCE

The University of Texas at Austin — Austin, TX

Graduate Research Assistant, Walker Department of Mechanical Engineering — Sept 2017 – Present

- Identified essential characteristics associated with post-stroke stiff-knee gait among 35+ gait features by variable selection based on mixed-effects penalized regression and random forest modeling.
- Discovered three gait phenotypes among 50 post-stroke individuals by time-series kernel k-means clustering.
- Found impact of using kinematic gait features on supervised machine learning classifications of 40 healthy participants' dual-task gait.
- Determined optimal 1-DOF linkage mechanism configuration to produce human-like end-effector motion trajectory by comparing numerically optimized designs based on gait datasets of 100+ individuals.
- Verified ability of IMU-based motion capture systems to track small changes in gait kinematics by using linear mixed-effect model.
- Mentored 10+ freshman students to develop a semester-long mechanical engineering research project.

Harmonic Bionics, Inc. — Austin, TX

System Validation Engineer Intern — May 2018 – Aug 2018; May 2019 – Aug 2019

- Invented electronic hardware debugging platform, achieving zero defective rates before shipment.
- Built C/C++ source code library and tutorial applications for EtherCAT motion controller and sensor interfaces.
- Created haptic interface demonstration kits using dual motors to exhibit at a technical conference.

Korea Institute of Science and Technology (KIST) — Seoul, South Korea

Research Assistant, Center of Bionics — Mar 2017 – July 2017

- Tested a non-invasive, patient-specific surgical tool navigation method for an orbital reconstructive surgery that improved registration and tool tracking accuracy by up to 50% with 3D printed phantom model.

Seoul Nation University — Seoul, South Korea

Graduate Research Assistant, Department of Mechanical Engineering — Sept 2013 – Aug 2014; Mar 2016 – Feb 2017

- Devised a needle steering scheme with a pivoted super-elastic Nitinol for MR image-guided breast needle intervention robot, improving needle insertion angle and tip movement with no actuator addition in robot.
- Designed vehicle door and driver's seat mockup for ingress/egress experiment with ten adjustable parameters.

The University of Texas Health Science Center (UTHealth) at Houston Houston, TX
Research Assistant, Vivian L Smith Department of Neurosurgery Sept 2014 – Feb 2016

- Designed surgical graspers with an outer diameter of less than 5mm with a passive grasper opening using an elastic element.
- Examined hysteresis of 7-DOFs dual-segmented continuum robotic manipulator by motorized testbed.
- Prototyped 7-DOFs cable-driven continuum robotic manipulator for single-port surgery.

EDUCATION

University of Texas at Austin Austin, TX
PhD candidate, Mechanical Engineering Expected Dec 2022
Dissertation: Characterization of post-stroke stiff-knee gait

Seoul National University Seoul, South Korea
MS, Mechanical Engineering Feb 2017
Thesis: Needle steering scheme within limited DOFs for MR-guided breast needle intervention robot

Hanyang University Seoul, South Korea
BS, Mechanical Engineering Feb 2013

TECHNICAL SKILLS

Programming: Proficient in Python, C/C++, R, MATLAB
CAD & EAD: Proficient in Solidworks, Experience in CATIA, EAGLE
Simulation: Proficient in OpenSim, Simulink real-time, Experience in Simscape, Labview, Multisim
Language: English (Fluent), Korean (Native)

SELECTED PUBLICATION *(3 OF 7)*

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.

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", in2019 IEEE 16th International Conference on Rehabilitation Robotics (ICORR), 2019, pp. 139–144.

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.