Jeonghwan ‘Jay’ Lee

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**PROFESSIONAL SUMMARY**

* PhD candidate trained in Mechanical Engineering, with 5+ years of experience in human subject research, medical robotics, and biomechanics.
* Proficient in scientific programming, such as machine learning, statistical analysis, kinematics/dynamics analysis, and numerical optimization, using Python, C/C++, R, and MATLAB.
* Skilled in processing and analyzing biomechanical, physiological signals (e.g., motion capture, electromyography, inertial measurement unit, indirect calorimetry).
* Experience in mechatronic system development and validation.
* Experience in leading early lab and start-up company development.

**CORE COMPETENCIES**

**Machine Learning, Statistical Modelling, Data Mining**

**Experimental Design, Human Locomotion Biomechanics**

**Design Optimization, System Validation, Kinematics & Dynamics Analysis**

**PROFESSIONAL EXPERIENCE**

**The University of Texas at Austin** Austin, TX

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

* Identifying a set of predictors for quadriceps spasticity in post-stroke individuals with a powered knee orthosis through tree-based machine learning algorithms (i.e., Random Forest, Bayesian Additive Regression Trees).
* Discovering three gait phenotypes among 50 post-stroke individuals by time-series kernel k-means clustering.
* Examining the biomechanical effects of exoskeleton’s weight distributions via 15 healthy individuals gait data to find optimal design parameters for lower extremity robotic exoskeletons.
* 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 motion capture systems based on inertial measurement units to track small changes in gait kinematics by a comparison of ground truth system, an optical motion capture system.
* 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.

**EXTRACURRICULAR EXPERIENCE**

**Korean Student Association at the University of Texas at Austin** Austin, TX

Graduate Student Representative of Department of Mechanical Engineering Sept 2020 – Aug 2021

* Managed semi-annual events of Korean graduate student association
* Coordinated campus recruiting events served by industries headquartered in South Korea.

**8th Fighter Wing, Republic of Korea Air Force** Wonju, South Korea

Executive Officer Sept 2006 – Nov 2008

* Principally responsible for the crew’s paychecks and the expenditure logs of the training.

**EDUCATION**

**University of Texas at Austin** Austin, TX

PhD candidate, Mechanical Engineering Expected Dec 2022

*Dissertation: Approaches in optimization and machine learning towards post-stroke 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.