JEONGHWAN 'JAY' LEE

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HIGHLIGHTS

- Ph.D. in Mechanical Engineering with expertise in robotics and human movement biomechanics, specializing in gait analysis and rehabilitation.
- 2+ years of software development experience after Ph.D. in industrial robot perception algorithms.
- Proficient in analyzing high-dimensional, multi-modal data from physiological sensors for scientific research.
- Skilled in applying statistical and machine learning models to real-world applications.

RESEARCH INTERESTS

Human Movement Biomechanics, Wearable Movement Monitoring, Personalized Modeling

EDUCATION

Ph.D. in Mechanical Engineering, University of Texas at Austin, TX 2022
Advisor: Dr. James Sulzer
Dissertation: Approaches in optimization and machine learning towards post-stroke gait

M.S. in Mechanical Engineering, Seoul National University, Seoul, South Korea 2017
Advisor: Dr. Kunwoo Lee

B.S. in Mechanical Engineering, Hanyang University, Seoul, South Korea 2013

RESEARCH & PROFESSIONAL EXPERIENCE

Sr. Robotics Engineer Sept 2022 – Present
Contoro Robotics, Austin, TX

- Lead robot perception software development for shipping container unloading automation.
- Developed machine learning and computer vision pipeline for pick-and-place tasks.

Graduate Research Assistant Sept 2017 – Aug 2022
The University of Texas at Austin, Austin, TX

- *Thesis work*: kinematic synthesis for a 1-DOF gait trainer, biomechanical variable selection for quadriceps hyperreflexia with exoskeletal assistance, and data-driven characterization of post-stroke Stiff-Knee Gait.
- *Collaborative works*: the impact of hip exoskeleton weight on gait patterns, and the effect of biomechanical features on dual-task gait classification.

System Validation Engineer Intern Summer 2018; Summer 2019
Harmonic Bionics, Austin, TX

- Built a haptic interface demo kit with dual motors, and a QA toolkit for motor controllers.

Research Assistant Mar 2017 – July 2017
Korea Institute of Science and Technology (KIST), Seoul, South Korea

- Evaluated algorithms for non-invasive, image-guided tracking of surgical tools.

Graduate Research Assistant Mar 2016 – Feb 2017
Seoul National University, Seoul, South Korea

- Developed a pivoted super-elastic needle steering scheme for MR-guided surgical robot.

Research Assistant Sept 2014 – Feb 2016
The University of Texas Health Science Center (UTHealth), Houston, TX

- Prototyped and tested hysteresis of a 7-DOF dual-segmented cable-driven continuum arm.

PEER REVIEWED ARTICLES

In review

1. **Lee, J.**, Seamon, A. Bryant., Lee, K. Robert., Kautz, A. Steven., Neptune, R. Richard., & Sulzer, J. S. (2024), Post-Stroke Stiff-Knee Gait: Are there different types or different severity levels?, Journal of NeuroEngineering and Rehabilitation (in review)

Journal Publications

2. **Lee, J.**, Lee, R. K., Seamon, B. A., Kautz, S. A., Neptune, R. R., & Sulzer, J. (2024). Between-limb difference in peak knee flexion angle can identify persons post-stroke with Stiff-Knee gait. Clinical Biomechanics, 106351.
3. **Lee, J.**, Akbas, T., & Sulzer, J. (2023). Hip and knee joint kinematics predict quadriceps hyperreflexia in people with post-stroke Stiff-Knee gait. Annals of Biomedical Engineering, 51(9), 1965-1974.
4. Normand, M. A., **Lee, J.**, Su, H., & Sulzer, J. S. (2023). The effect of hip exoskeleton weight on kinematics, kinetics, and electromyography during human walking. Journal of biomechanics, 152, 111552.
5. Chiarello, M., **Lee, J.**, Salinas, M. M., Hilsabeck, R. C., Lewis-Peacock, J., & Sulzer, J. (2022). The effect of biomechanical features on classification of dual-task gait. IEEE sensors journal, 23(3), 3079-3089.
6. **Lee, J.**, Li, L., Shin, S. Y., Deshpande, A. D., & Sulzer, J. (2021). Kinematic comparison of single degree-of-freedom robotic gait trainers. Mechanism and Machine Theory, 159, 104258.
7. Park, S. M., **Lee, J.**, Park, S., Lee, J. W., Park, M., Kim, Y., & Noh, G. (2020). Practical bending-angle calculation for an automated surgical plate bending apparatus. Journal of Mechanical Science and Technology, 34, 2101-2109.
8. **Lee, J.**, Mekuria, K., Son, T. G., Jeong, W. S., Choi, J. W., & Kim, Y. (2019). A novel noninvasive patient-specific navigation method for orbital reconstructive surgery: A phantom study using patient data. Plastic and Reconstructive Surgery, 143(3), 602e-612e.

9. Kim, Y., Choi, E. S., Seo, J., Choi, W. S., **Lee, J.**, & Lee, K. (2019). A novel approach to predicting human ingress motion using an artificial neural network. Journal of biomechanics, 84, 27-35.
10. Kim, H., Son, T. G., **Lee, J.**, Kim, H. A., Cho, H., Jeong, W. S., ... & Kim, Y. (2019). Three-dimensional orbital wall modeling using paranasal sinus segmentation. Journal of Cranio-Maxillofacial Surgery, 47(6), 959-967.
11. Park, S., **Lee, J.**, Park, S. M., Noh, G., Lee, J. W., Park, M. S., & Kim, Y. (2019). A novel motorized bending apparatus for surgical plates. Journal of Mechanical Science and Technology, 33, 3743-3748.

Conference Proceedings

12. **Lee, J.,** Shin, S. Y., Ghorpade, G., Akbas, T., & Sulzer, J. (2019, June). Sensitivity comparison of inertial to optical motion capture during gait: implications for tracking recovery. In 2019 IEEE 16th international conference on rehabilitation robotics (ICORR) (pp. 139-144). IEEE.

CONFERENCE PRESENTATIONS

1. **Lee, J.,** Shin, S. Y., Ghorpade, G., Akbas, T., & Sulzer, J., 2019, Sensitivity comparison of inertial to optical motion capture during gait: implications for tracking recovery. In 2019 IEEE 16th international conference on rehabilitation robotics (ICORR), Toronto, Canada, June 24–28.
2. **Lee, J.**, Park, S.B., Lee, K., and Jo, Y.H., 2017. Computational Model to Steer Super Elastic Needle for an MRI Guided Breast Intervention Robot, Computer Assisted Radiology and Surgery Proceedings of the 31st International Congress and Exhibition, Barcelona, Spain, June 20-24.

TEACHING EXPERIENCE

Graduate Teaching Assistant, Mechanical Engineering
The University of Texas at Austin, Austin, TX

- ME 397 Introduction to robot modeling and control — Spring 2021
- ME 140L Mechatronics Laboratory — Fall 2018; Spring 2019; Spring 2020
- ME 340 Mechatronics — Fall 2019

Graduate Student Mentor, Mechanical Engineering
The University of Texas at Austin, Austin, TX
Mentored 10+ freshman students to develop a semester-long research project.

- Freshman Introduction to Research In Engineering (FIRE) Program — Fall 2018; Fall 2019

REVIEW EXPERIENCE

Scientific Report
Journal of Mechanism and Machine Theory
Journal of NeuroEngineering and Rehabilitation
Engineering Applications of Artificial Intelligence
International Conference on Rehabilitation Robotics

TECHNICAL SKILLS

	Proficient	Moderate
Programming Languages	Python, C/C++, MATLAB	C#, SQL
Robotics Middleware	Robot Operation System (ROS / ROS2)	
ML Frameworks / Statistics	SciPy, R, PyTorch	TensorFlow
Simulation Frameworks	OpenSim, Gazebo	MATLAB Simulink
Design Tools	SolidWorks	Eagle
Software Platforms	Docker	

PROFESSIONAL TRAINING AND CERTIFICATES

Data Science and Applied Machine Learning May 2021
The University of Texas at Austin, Department of Statistics and Data Sciences

Scalable Machine Learning: Methods and Tools May 2021
The University of Texas at Austin, Department of Statistics and Data Sciences

PATENTS

1. Kim, Y., **Lee, J.**, Park, S., Park, S.M., Cho, H., Kim, L., Noh, G., Lee, J.W., Lee, B.H., 2020. Automatic bending apparatus of plate for surgery, Republic of Korea (KR) Patent, No. 1021566940000.

HONORS AND AWARDS

Brain Korea 21 Plus, Seoul National University, Seoul, South Korea 2014
Merit-based Scholarship, Seoul National University, Seoul, South Korea 2014
Academic Scholarship, Hanyang University, Seoul, South Korea 2011

EXTRACURRICULAR SERVICES

Graduate Student Representative Sept 2020 – Aug 2021
Korean Student Association at the University of Texas at Austin Austin, TX

Sergeant, Information and Communications Specialist Sept 2006 – Nov 2008
8th Fighter Wing, Republic of Korea Air Force Wonju, South Korea

REFERENCES

James Sulzer
Associate Professor, Staff Scientist, Department of Physical Medicine and Rehabilitation,
MetroHealth Hospital / Case Western Reserve University
jss280@case.edu

Richard Neptune
Professor, Walker Department of Mechanical Engineering,
The University of Texas at Austin
rneptune@mail.utexas.edu

Hao Su
Associate Professor, Department of Mechanical and Aerospace Engineering,
The North Carolina State University
hsu4@ncsu.edu

Steven Kautz
Professor, Department of Health Sciences and Research,
Medical University of South Carolina
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