JEONGHWAN 'JAY' LEE

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I am currently a **Senior Robotics Engineer** at Contoro Robotics, where I lead the development of **robot perception software**. I hold a **Ph.D. in Mechanical Engineering** from the University of Texas at Austin, specializing in post-stroke pathological gait analysis with a focus on maximizing functional recovery through **musculoskeletal biomechanics** and **wearable robotics/sensing technologies**.

EDUCATION

Ph.D. in Mechanical Engineering, University of Texas at Austin, TX　　　　2022
- Advisor: Dr. James Sulzer

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

PEER REVIEWED ARTICLES

In review / In preparation

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? (in preparation)

2. **Lee, J.**, Lee, K. Robert., Seamon, A. Bryant., Kautz, A. Steven., Neptune, R. Richard., & Sulzer, J. S. (2024), Between-limb difference in peak knee flexion angle can identify persons post-stroke with Stiff-Knee gait. Clinical Biomechanics (in review)

Journal Publications

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.

WORK EXPERIENCE

Sr. Robotics Engineer - Perception   Sept 2022 – Present
Contoro Robotics, Austin, TX
- Led the development of a robot perception pipeline for environmental perception, navigation, teleoperation, and 6D pose extraction from objects, achieving accuracy within 1% based on working distance.
- Developed a human-in-the-loop segmentation workflow that integrates instance and zero-shot segmentation, reducing failure rates during operation while simultaneously collecting annotated data.
- Curated a machine learning dataset for the development of a customer-specific prediction model.
- Built a comprehensive shipping label scanning workflow, integrating barcode scanning and optical character recognition using open-source object detection and the Google Vision API.

System Validation Engineer Intern   May 2018 – Aug 2018; May 2019 – Aug 2019
Harmonic Bionics, Inc., Austin, TX
- Developed a C/C++ library and tutorial applications for EtherCAT motion controllers and sensor interfaces.
- Built haptic interface demo kits with dual motors for a technical conference exhibition.

Research Assistant   Mar 2017 – July 2017
Korea Institute of Science and Technology (KIST), Seoul, South Korea
- Tested a non-invasive, patient-specific surgical tool navigation method for orbital reconstructive surgery, improving registration and tool tracking accuracy by up to 50% using a 3D-printed phantom model.

Research Assistant   Sept 2014 – Feb 2016
The University of Texas Health Science Center (UTHealth), Houston, TX
- Contributed to spinning off a new venture from a laboratory setup, developing the initial product and establishing scalable engineering processes (now Endoquest Robotics).
- Prototyped and tested hysteresis of a 7-DOF dual-segmented cable-driven continuum robotic manipulator for single-port surgery using a motorized testbed.

TEACHING EXPERIENCE

Graduate Teaching Assistant, Mechanical Engineering
The University of Texas at Austin, Austin, TX
- Coordinated quizzes, exams, projects, grading and labs.
  - 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

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

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

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.

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	

REFERENCES

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

Ashish Deshpande
Professor, Walker Department of Mechanical Engineering,
The University of Texas at Austin
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