

# JEONGHWAN ‘JAY’ LEE

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## HIGHLIGHTS

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- Ph.D. in Mechanical Engineering with expertise in robotics and biomechanics, specializing in neurorehabilitation.
- 2+ years of industrial experience after Ph.D. working robotics and computer vision software development.
- Proficient in analyzing and modeling high-dimensional time series and multi-modal physiological sensor data.
- Skilled in machine learning and deep learning models in real-world applications.

## RESEARCH INTERESTS

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Neurorehabilitation, Wearable Sensing & Robotics, Biomechanics

## EDUCATION

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**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

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**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**  
Harmonic Bionics, Austin, TX

Summer 2018; Summer 2019

- 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

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### *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**

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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**

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### **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**

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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

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

## PROFESSIONAL TRAINING AND CERTIFICATES

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<b>Data Science and Applied Machine Learning</b>	May 2021
The University of Texas at Austin, Department of Statistics and Data Sciences	
<b>Scalable Machine Learning: Methods and Tools</b>	May 2021
The University of Texas at Austin, Department of Statistics and Data Sciences	

## PATENTS

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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

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

## EXTRACURRICULAR SERVICES

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<b>Graduate Student Representative</b>	Sept 2020 – Aug 2021
Korean Student Association at the University of Texas at Austin	Austin, TX
<b>Sergeant, Information and Communications Specialist</b>	Sept 2006 – Nov 2008
8 <sup>th</sup> Fighter Wing, Republic of Korea Air Force	Wonju, South Korea

## REFERENCES

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**James Sulzer**

Associate Professor, Staff Scientist, Department of Physical Medicine and Rehabilitation,  
MetroHealth Hospital / Case Western Reserve University  
[jss280@case.edu](mailto:jss280@case.edu)

**Ashish Deshpande**

Professor, Walker Department of Mechanical Engineering,  
The University of Texas at Austin  
[ashish@austin.utexas.edu](mailto:ashish@austin.utexas.edu)

**Richard Neptune**

Professor, Walker Department of Mechanical Engineering,  
The University of Texas at Austin  
[rneptune@mail.utexas.edu](mailto:rneptune@mail.utexas.edu)

**Hao Su**

Associate Professor, Department of Mechanical and Aerospace Engineering,  
The North Carolina State University  
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**Steven Kautz**

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