JEONGHWAN 'JAY' LEE

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SUMMARY

Ph.D. in Mechanical Engineering with expertise in **biomechanics, post-stroke gait rehabilitation** and **data science** for **wearable robotics** applications. Over 5 years of clinical research experience, specializing in human subject study design, statistical analysis, musculoskeletal simulation, and time-series biomechanical signal processing (kinematics, kinetics, inertial measurement units and electromyography). Additional 3 years of industrial experience leading **robot perception** software development, with a focus on multi-modal sensor data acquisition, computer vision, and cloud-based AI pipelines. Demonstrated track record of delivering innovative solutions in fast-paced start-up and scale-up environments.

CURRENT AFFILIATION

Massachusetts Institute of Technology — Cambridge, MA
Postdoctoral Associate at the Department of Brain and Cognitive Science — Apr 2025 – Present

- **Developing physics-informed, neuromechanics-grounded predictive simulation of human motion** by integrating modern generative AI with computational neuromechanics to advance understanding of human embodiment.
- **Collaborating interdisciplinary research projects:** i) data-driven functional and cognitive assessments of the cutaneous mechanoneuronal interface for neuroprosthesis; ii) exploration of how humans and generative AI compress information into flexible, efficient representations in vision and language.

INDUSTRY EXPERIENCE

Contoro Robotics — Austin, TX
Senior Robotics Engineer – Perception — Sept 2022 – Mar 2025

- **Led the development of a ROS-integrated, multi-functional robot perception pipeline** with object detection, image segmentation, 6D pose estimation, optical character recognition, and teleoperation feedback, enhancing reliability and flexibility in real-world use.
- **Designed a cloud-based human-in-the-loop segmentation and online data re-labeling workflow** combining instance and zero-shot segmentation, achieving 2% operational failures and improving model robustness through continuous data annotation.
- **Established a decentralized machine learning model training pipeline** for customer-specific training, collaboratively enhancing a global model by 10% in performance and scalability.
- **Developed an automated, multi-step hand-eye calibration methodology** for a multi-camera setup (eye-in-hand, eye-to-hand, and stereo), achieving localization accuracy within 0.5% of working distance.
- **Led technical demonstrations** that played a pivotal role in securing $4.7 million in Seed and $12 million in Series A funding.

Harmonic Bionics, Inc. (now Bioness Medical) — Austin, TX
System Validation Engineer Intern — May 2019 – Aug 2019

- **Developed C/C++ EtherCAT library** for motion controllers and sensor interfaces.
- **Built dual-motor haptic demo kits** for exhibitions, demonstrating advanced motion control capabilities.

RESEARCH EXPERIENCE

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

- **Led three data-driven research initiatives** in human movement biomechanics to advance wearable robotics for post-stroke gait rehabilitation, culminating in four first-authored publications.
- **Supervised two master's students in research** on gait biomechanics related to cognitive decline and exoskeleton design, resulting in two co-authored publications.
- **Managed the end-to-end research process**: study conceptualization, securing funding, data collection/analysis (kinematics, kinetics, and EMG), interpretation, visualization, publication authorship, and presentation.
- **Collaborated with a multidisciplinary team** of neuroscientists and clinicians to drive innovative solutions.

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

Seoul National University   Seoul, South Korea
Graduate Research Assistant   Mar 2016 – Feb 2017
- **Developed a needle steering scheme** using pivoted super-elastic Nitinol for an MR-guided breast needle intervention robot, enhancing insertion angle control with a targeting error of less than 5mm.
- **Designed a vehicle door and driver's seat mockup** with ten adjustable parameters, enabling controlled ingress/egress experiments.

The University of Texas Health Science Center (UTHealth)   Houston, TX
Research Assistant   Sept 2014 – Feb 2016
- **Prototyped and tested hysteresis** of a 7-DOF dual-segmented cable-driven continuum robotic manipulator for single-port surgery using a motorized testbed.
- **Contributed to transitioning a lab innovation into a commercial venture**, supporting initial product development and establishing scalable engineering processes (now Endoquest Robotics).

EDUCATION

Ph.D. in Mechanical Engineering, University of Texas at Austin, TX   2022
M.S. in Mechanical Engineering, Seoul National University, Seoul, South Korea   2017
B.S. in Mechanical Engineering, Hanyang University, Seoul, South Korea   2013

SKILLS

Programming:	Python, C/C++, C#, MATLAB, Bash/Shell
Statistics / ML Platform:	SciPy, R, PyTorch, TensorFlow
DevOps / SysAdmin:	Docker, Git, Linux/Unix
Robotics Middleware:	Robot Operation System (ROS / ROS2)
Simulation Tools:	MuJoCo, Isaac Gym, Isaac Lab, ROS Gazebo, Simulink, Simscape, OpenSim
Design Tools:	SolidWorks, Eagle

CERTIFICATES

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

SELECTED PEER REVIEWED ARTICLES (3 OUT OF 12) – GOOGLE SCHOLAR

*Selected works focus on data-driven approaches, biomechanics, and wearable sensors for developing personalized solutions in post-stroke rehabilitation.

1. **Lee, J.**, Seamon, B. A., Lee, R. K., Kautz, S. A., Neptune, R. R., & Sulzer, J. S. (2025). Post-stroke Stiff-Knee gait: are there different types or different severity levels?. Journal of NeuroEngineering and Rehabilitation, 22(1), 36.
2. **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.
3. **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.

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.