Kyungjoon (Harry) Lee

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Professional Summary

Soft Robotics R&D Engineer with 5+ years of experience developing soft actuators with integrated smart materials and wearable robotic systems with embedded sensing and control for safe human-robot interaction. Published 6 peer-reviewed papers on soft robot actuation and impedance control. Proven end-to-end R&D ownership, from rapid prototyping to experimental validation, data analysis, and presentation.

Education

University of California, Riverside - Ph.D. in Mechanical Engineering — Expected June 2026
University of California, Riverside - M.S. in Mechanical Engineering — Mar 2025
The Cooper Union for the Advancement of Science and Art - B.E. in Mechanical Engineering — June 2020

Work Experience

Graduate Student Researcher Robotics and Medical Systems Lab, UCR - Riverside, CA — June 2020 - Present

- Led NSF funded research on developing wearable robots that modulate upper-limb impedance for individuals with motor impairments, resulting in 4 peer-reviewed journal publications
- Supervised and mentored 13 undergraduate students across 6 research teams, resulting in 2 co-authored publications and 3 conference presentations
- Owned preventive maintenance and troubleshooting for $100K+ lab assets, maintaining 98% uptime

Selected Research Projects

Variable Damping of Pneumatic Soft Robots with Shape Memory Alloys — Mar 2024 - Aug 2025
RaMS Lab, UCR - Graduate Student Researcher

- Engineered a soft wearable robot to suppress upper-limb tremors, reducing tremor stabilization time by 50.2%
- Pioneered pure damping control in soft actuators by using SMA hysteresis to decouple stiffness from damping
- Achieved energy dissipation range of 0.47 to 32.23 mJ (-91.7% to +140.9%), with minimal stiffness change
- Built a benchtop characterization rig and executed a 27-condition DOE to fully quantify actuator impedance
- Validated real-world applicability on a phantom arm, achieving 62.4% damping and 2.6% stiffness change
- Authored a first-author peer-reviewed journal publication in *Smart Materials and Structures*

Design and Characterization of Soft Fabric Omnidirectional Bending Actuators — Aug 2022 - Mar 2024
RaMS Lab, UCR - Graduate Student Researcher

- Outperformed prior state-of-the-art soft continuum actuator, increasing force-to-weight ratio by 64%
- Optimized actuator design to reduce mass by 31% while retaining 90° RoM and increasing payload to 10.99 N
- Replaced shop-scale fabrication with desktop tools, improving replicability and lowering fabrication cost by 80%
- Enabled programmable stiffness modulation via antagonistic actuation, achieving up to 320% baseline stiffness
- Built a benchtop rig with EM tracking and a 6-axis force sensor to map actuator workspace and force profile
- Authored a first-author peer-reviewed journal publication in *Actuators*

Skills

Hardware & Fabrication: Rapid prototyping, SolidWorks, GD&T, CNC machining, Milling, Lathe, 3D printing, Laser cutting, Silicone molding and casting, Pneumatic and hydraulic soft actuators, Smart materials integration
Controls & Software: Embedded systems, Real-time control, Closed-loop control, Impedance control, Sensor integration, Signal processing, Circuit design, C++, Python, MATLAB, Arduino, OpenCV
Testing & Analysis: Benchtop characterization, Instrumentation and DAQ, DOE, System identification

Publications

[1] **Lee, K.**, AfshariNejad, P., Liu, T., Realmuto, J., & Sheng, J. (2025).
Variable damping of pneumatic soft robots with shape memory alloys.
Smart Materials and Structures. DOI: 10.1088/1361-665X/adf7ec.

[2] **Lee, K.**, Bayarsaikhan, K., Aguilar, G., Realmuto, J., & Sheng, J. (2024).
Design and characterization of soft fabric omnidirectional bending actuators.
Actuators. DOI: 10.3390/act13030112.

[3] Wang, H., Zhang, K., **Lee, K.**, Mei, Y., Zhu, K., Srivastava, V., Sheng, J., & Li, Z. (2024).
Mechanical design and data-enabled predictive control of a planar soft robot.
IEEE Robotics and Automation Letters. DOI: 10.1109/LRA.2024.3434929.

[4] Manian, V., Oda, K., AfshariNejad, P., **Lee, K.**, Akbari, A., & Sheng, J. (2025).
Soft bidirectional shape memory alloy actuators for robotic catheters.
IEEE Robotics and Automation Letters. DOI: 10.1109/LRA.2025.3598662.

[5] AfshariNejad, P., **Lee, K.**, Vu, S., Penchala, A., Sevic, S., Manian, V., & Sheng, J. (2026).
Soft robotic catheters enabled by miniaturized bending and torsional hydraulic soft actuators.
2026 International Symposium on Medical Robotics (In press).

[6] Wang, H., Zhang, K., **Lee, K.**, Mei, Y., Srivastava, V., Sheng, J., & Li, Z. (2026).
Velocity-form data-enabled predictive control of soft robots under unknown external payloads.
IEEE Robotics and Automation Letters (Under Review).

Presentations

[1] **Lee, K.**, AfshariNejad, P., Penchala, A., Vu, S., Manian, V., Sevic, S., & Sheng, J. (2025).
Towards miniaturized bending and torsional soft actuators for robotic catheters.
2025 IEEE 21st International Conference on Automation Science and Engineering (CASE).

[2] **Lee, K.**, Bayarsaikhan, K., Aguilar, G., Realmuto, J., & Sheng, J. (2024).
Design and characterization of soft fabric omnidirectional bending actuators.
2024 Southern California Robotics Symposium (SCR).

[3] Manian, V., Oda, K., **Lee, K.**, AfshariNejad, P., & Sheng, J. (2024).
Soft bidirectional shape memory alloy actuator for robotic catheters.
2024 Southern California Robotics Symposium (SCR).

Honors and Awards

Dissertation Completion Fellowship Award | University of California, Riverside	2026
Lung-Wen Tsai Design Award | University of California, Riverside	2024
Dean's Distinguished Ph.D. Fellowship | University of California, Riverside	2021 - 2023
2nd Place Overall, SAE AeroConnect Challenge | SAE International	2020
Half Tuition Scholarship, Innovator's Merit Award | The Cooper Union	2016 - 2020