

Hun Chan (Bryan) Lee

Boston, MA | [hunchanl.github.io](https://github.com/hunchanl) | [Google Scholar](https://scholar.google.com/citations?user=hcle94) | hcle94@bu.edu

EDUCATION

Boston University

Ph.D. Candidate, Mechanical Engineering

Advisor: Prof. Sheila Russo

Boston, MA

Sept. 2021 - Present

Purdue University

Master of Science, Mechanical Engineering

Advisor: Prof. Raymond Cipra

West Lafayette, IN

Aug. 2016 - Aug. 2018

GPA: 3.81 / 4.00

Purdue University

Bachelor of Science, Mechanical Engineering

(Highest Distinction)

West Lafayette, IN

Aug. 2012 - May 2016

GPA: 3.96 / 4.00

RESEARCH EXPERIENCE

Material Robotics Lab, Boston University

Advisor: Prof. Sheila Russo

Sept. 2021 - Present

- Developed a layer-by-layer fabrication process—involving laser machining, plasma etching, and lamination—for soft-rigid hybrid robots. This enabled monolithic integration of a soft actuator, ionic resistive sensor, and rigid-flexible mechanical controller into a single system with a 90 % manufacturing success rate.
- Designed and programmed an autonomous soft–rigid hybrid robot for laser-assisted surgery in ROS 2. Integrated machine learning interpreted optical proprioceptive sensors (99% accuracy) and implemented a model-free control via online Jacobian correction, reducing trajectory following time by 10%.
- Designed and prototyped an innovative Miura-ori pattern-inspired soft retractor with a capacitive sensor for neurosurgical applications, enhancing precision and adaptability in surgical procedures.

Cipra Lab, Purdue University

Advisor: Prof. Raymond Cipra

Aug. 2016 - Aug. 2018

- Developed and optimized the design of a wearable, 3D-printed prosthetic hand with compliant joints, utilizing rapid prototyping techniques.
- Utilized MATLAB image processing techniques to analyze the motion of the prosthetic hand

Vlachos Research Group, Purdue University

Advisor: Prof. Pavlos Vlachos

Jan. 2015 - May 2016

- Constructed and optimized a realistic circulation loop and compliance chamber model, accurately replicating the intricate blood flow patterns in cerebral aneurysms

WORK EXPERIENCE

IntheSmart Co., Ltd.

Research and Design Team Member

Seoul, South Korea

Aug. 2018 - Aug. 2021

- Led the hardware research and development for the Laser Speckle Contrast Imaging (LSCI) system, a laser-based blood flow meter, and acquired Korean Good Manufacturing Practice (K-GMP) certification for the system.
- Integrated a YOLOv5 object detection machine learning model (94.7% precision) into a handheld RGB and NIR dual-imaging system with a 19.5 ms processing time, enhancing parathyroid gland (PG) identification rates and viability diagnostic accuracy.
- Developed and implemented over 20 experiment/calibration protocols and designed electro-mechanical test jigs and fixtures to improve the functionality of fluorescence laparoscopy systems that integrate RGB and NIR imaging.
- Shadowed over 150 preclinical and clinical trial cases across various general surgery divisions and directly worked with clinicians to gather and incorporate their feedback to refine surgical imaging systems.

PUBLICATIONS (J: Journal Article, C: Conference Proceeding, P: Patent, *Equally Contributed)

JOURNAL ARTICLES

- J1. Lee, H.C.,** Cho, H., Kothandaraman, A., Dembrow, D., Kwon, J., and Russo, S., 2025. Model-Free Control of a Soft-Rigid Hybrid Robot for Laser-Assisted Surgery. *Submitted*
- J2. Lee, H.C.,** Elder, N., Leal, M., Stantial, S., Vergara Martinez, E., Jos, S., Cho, H., and Russo, S., 2024. A fabrication strategy for millimeter-scale, self-sensing soft-rigid hybrid robots. *Nature Communications*, 15(1), p.8456. **Cover Article**
- J3. Lee, H.C.,** Pacheco, N.E., Fichera, L. and Russo, S., 2022. When the end effector is a laser: A review of robotics in laser surgery. *Advanced Intelligent Systems*, 4(10), p.2200130.

- J4.** Kim, Y.*, **Lee, H.C.** *, Kim, J.*, Oh, E., Yoo, J., Ning, B., Lee, S.Y., Ali, K.M., Tufano, R.P., Russell, J.O. and Cha, J., 2022. A coaxial excitation, dual-red-green-blue/near-infrared paired imaging system toward computer-aided detection of parathyroid glands in situ and ex vivo. *Journal of Biophotonics*, 15(8), p.e202200008.
- J5.** Oh, E., **Lee, H.C.**, Kim, Y., Ning, B., Lee, S.Y., Cha, J. and Kim, W.W., 2022. A pilot feasibility study to assess vascularity and perfusion of parathyroid glands using a portable hand-held imager. *Lasers in Surgery and Medicine*, 54(3), pp.399-406. ***Cover Article***
- J6.** **Lee, H.C.** and Cipra, R., 2020. Design of a Novel Locking Ratcheting Mechanism for a Body-Powered Underactuated Hand. *Journal of Medical Devices*, 14(1), p.011101.

CONFERENCE PROCEEDINGS

- C1.** **Lee, H.C.**, Cho, H., Kothandaraman, A., Dembrow, D., Kwon, J., and Russo, S., 2025, A Soft-Rigid Hybrid Robot with Optical Proprioceptive Sensing for Laser-Assisted Surgery, *The Hamlyn Symposium on Medical Robotics [Accepted]*
- C2.** Van Lewen D., Wang C., **Lee H.C.**, Devaiah A., Upadhyay U., and Russo S., 2024. Monitoring Forces in Soft Robotic Brain Retraction via Origami Sensing Modules. *The Hamlyn Symposium on Medical Robotics*
- C3.** Van Lewen, D., Wang, C., **Lee, H.C.**, Devaiah, A., Upadhyay, U. and Russo, S., 2024, May. Capacitive Origami Sensing Modules for Measuring Force in a Neurosurgical, Soft Robotic Retractor. In *2024 IEEE International Conference on Robotics and Automation (ICRA)* (pp. 5302-5308). IEEE.
- C4.** Bhugubanda, S., **Lee, H.C.**, Kifle, N., Kim, Y. and Cha, J., 2023, March. Multi-directional adjustable two-camera housing module for medical applications. In *Design and Quality for Biomedical Technologies XVI* (Vol. 12370, p. 1237002). SPIE.

PATENT

- P1.** Jaepyeong, Cha. and **Lee, H.C.**, Optosurgical LLC, 2023. Method and apparatus for biometric tissue imaging. **U.S. Patent Application** 17/854,084. [*Pending*]

TEACHING EXPERIENCE

Teaching Assistant

Electromechanical Design

Sept. 2022 - Dec. 2022

- Assisted the electromechanical system design lab sessions (Topics: Arduino, electromechanical system design)

Machine Design

Jan. - May 2017 & Jan. - May 2018

- Instructed the machine design lab sessions (Topics: the kinetics and kinematics of machines, the stress analysis of machine components)

Mechanical Engineering Design, Innovation, and Entrepreneurship

Aug. - Dec. 2016 & Aug. - Dec. 2017

- Instructed the design lab session and guided in applying engineering principles to open-ended problems.

Conference Presentations

- A Monolithic Fabrication Method for Proprioceptive Soft-Foldable Robots, Oral Presentation at *Society of Engineering Science (SES)*, Minneapolis, MN, October 8-11, 2023
- A Monolithic Fabrication Strategy for Millimeter-Scale, Self-Sensing Actuators, Oral Presentation at *Materials Research Society (MRS)*, San Francisco, CA, April 25-27, 2023

Honors and Awards

- Distinguished Mechanical Engineering Fellowship *2021*
- Dean's List *2012-2016*
- Semester Honor *2012-2016*
- EPICS AMD Design Award *2014*
- School of Mechanical Engineering Scholarship *2013*

Technical Skills

- 3D Modeling:** SOLIDWORKS, CATIA
- Simulation:** Abaqus
- PCB Designing:** Altium
- Programming:** Python, MATLAB, C, ROS2, PyTorch
- Fabrication:** Laser micromachining, Plasma Etching, Lamination, 3D Printing