

# KAYMIE SHIOZAWA

## Education

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<b>Massachusetts Institute of Technology (MIT)</b> <i>Candidate for Doctor of Philosophy in Mechanical Engineering</i> GPA: 5.0/5.0 Advisor: Dr. Neville Hogan; Thesis: Quantifying human balance performance and control to inform therapy.	<b>Cambridge, MA</b> Spring 2025
<b>Massachusetts Institute of Technology (MIT)</b> <i>Master of Science in Mechanical Engineering</i> GPA: 5.0/5.0 Advisor: Dr. Neville Hogan; Thesis: Towards the development of an adaptive rehabilitative device.	<b>Cambridge, MA</b> June 2021
<b>Massachusetts Institute of Technology (MIT)</b> <i>Bachelor of Science in Mechanical Engineering</i> GPA: 4.8/5.0 Advisor: Dr. Harry Asada; Thesis: Gaze tracking: seeking critical information for autonomous excavation.	<b>Cambridge, MA</b> June 2019

## Awards, Honors, and Fellowships

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Kaufman Teaching Certificate (in progress)	2024
MIT Meredith Kamm Memorial Award for Excellence in a Woman Graduate Student ( <b>\$3,000</b> )	2024
MIT Graduate Student Council Conference Grant ( <b>\$1,000</b> )	2024
Mathworks Mechanical Engineering Fellowship ( <b>\$102,500</b> )	2023
Charles M. Vest Grand Challenges for Engineering Fellowship ( <b>\$49,175</b> )	2023
Hugh Hampton Young Memorial Fund Fellowship ( <b>\$96,117</b> )	2022
Runner-Up Presentation: MIT Mechanical Engineering Research Exhibition ( <b>\$250</b> )	2021
Inaugural Accenture Fellowship ( <b>\$89,476</b> )	2020
Runner-Up Presentation: MIT Mechanical Engineering Research Exhibition ( <b>\$250</b> )	2020
John and Miyoko Davey Foundation Merit Scholarship ( <b>\$20,000</b> )	2018
Most Valuable Engineer: 2.12 Introduction to Robotics Competition	2017
2 <sup>nd</sup> Place Team: 2.12 Introduction to Robotics Competition	2017
• Designed, fabricated, and controlled a robotic arm and serial elastic actuator to aid hemiplegic patients	
Quarterfinalist (out of 160 participants): 2.007 Manufacturing and Design Robotics Competition	2017
Two Sigma Prize for Innovative Design: MIT Autonomous Robotics Competition	2016
2 <sup>nd</sup> Place Team: MIT Autonomous Robotics Competition ( <b>\$6,000</b> )	2016

## Research Experience

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### MIT Newman Lab

Graduate Research Assistant, Advisor: Dr. Neville Hogan

Cambridge, MA

Sept. 2019 – Present

- Three 1<sup>st</sup> author manuscripts published in *J Neuroengineering and Rehabilitation* and *J Neurophysiology*
- Studying human neuromotor control strategy during balance by simulating a balancing human and validating results with unimpaired younger adults', unimpaired older adults', and impaired adults' data
- Developing a novel assessment method that quantifies standing balance ability and control strategy in humans
- Quantifying balance ability in human subjects through the development of an instrumented cane and algorithm
- Conducted human subject experiments on younger and older adults to validate the instrumented cane's predictive algorithm for balance ability

### Microsoft Research Applied Robotics Research Group

Research Intern, Advisor: Dr. Katsu Ikeuchi

Seattle, WA

June – Aug 2022

- Designed a framework and model to teach a bipedal robot to walk using reinforcement learning
- Studied the effect of curricula inspired by human neurorehabilitation on the learning outcome in simulation
- Wrote a paper and submitted it to the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

### MIT D'Arbeloff Lab

Undergraduate Research Assistant, Advisor: Dr. Harry Asada

Cambridge, MA

Sept. 2017 – May 2019

- Employed gaze tracking to distinguish a human operator's focus points, used deep learning (CNN) to find trends
- Selected as a scholar for SuperUROP, a competitive yearlong advanced research program; wrote thesis and presented in two poster sessions
- Designed and manufactured a base for a robotic excavator to add a degree of freedom through 3D modeling (CAD), material selection, and manufacturing methods such as water jetting and milling

### Pacific Northwest National Laboratory (PNNL) (U.S. Department of Energy)

Research Intern, Advisor: Dr. Sarah Newman

Seattle, WA

Jan. 2019

- Published a 2<sup>nd</sup> author paper in the *Journal of Renewable Energy*
- Contributed to the development of a (Python) software tool that sizes microgrids to facilitate off-grid operation
- Analyzed the effectiveness of the tool by measuring resiliency of sized microgrid designs

### CEA-LETI: Embedded Micro Batteries Laboratory

Research Intern, Advisor: Dr. Christophe Dubarry

Grenoble, France

June – Aug. 2016

- Determined properties of battery electrolytes using electrical impedance characterization for efficient batteries
- Presented findings to lab of 40 people; cooperated and communicated with team of 5 members in French

## Patents

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1. **Shiozawa, K.**, Burns, M., and Hogan, N., 2024, "Instrumented Cane that Quantifies Balance Ability," provisional patent US 63/642,951.
2. Jeffords, C. et al., **Shiozawa, K.**, 2022, "Anomaly-Based Mitigation of Access Request Risk," US20220345457A1 [[Link](#)].

## Peer-Reviewed Journal Publications \*Corresponding Author

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1. Burns, M., **Shiozawa, K.\***, Hogan, N., 2024, “Evaluation of Quiet Standing with an Instrumented Cane,” *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, under review.
2. **Shiozawa, K.\***, Sugimoto-Dimitrova, R., Gruben, K. G., and Hogan, N., 2024, “Human Foot Force Suggests Different Balance Control Strategies between Healthy Younger and Older Adults,” *Journal of Neurophysiology*, in press [Link].
3. **Shiozawa, K.**, Russo, M.\*, Lee, J., Hogan, N., and Sternad, D., 2024, “Human Foot Force Informs Balance Control Strategies when Standing on a Narrow Beam,” *Journal of Neurophysiology* [Link].
4. Sugimoto-Dimitrova, R.\*, **Shiozawa, K.**, Gruben, K. G., and Hogan, N., 2024, “Frequency-Domain Patterns in Foot-Force Line-Of-Action: An Emergent Property of Standing Balance Control,” *Journal of Neurophysiology*, in press [Link].
5. **Shiozawa, K.**, Lee, J.\*, Russo, M., Sternad, D., and Hogan, N., 2021, “Frequency-Dependent Force Direction Elucidates Neural Control of Balance,” *Journal of Neuroengineering and Rehabilitation* [Link].
6. Newman, S.\*, **Shiozawa, K.**, Follum, J., Barrett, E., Douville, T., Hardy, T., and Solana, A., 2020, “A Comparison of PV Resource Modeling for Sizing Microgrid Components,” *Renewable Energy* [Link].

## Conference Presentations

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1. **Shiozawa, K.**, Sugimoto-Dimitrova, R., Gruben, K. G., and Hogan, N., 2024, “Human Foot Force Reveals Different Balance Strategies between Healthy Younger and Older Adults.” Poster presentation at the *2024 MIT Mechanical Engineering De Florez Award Competition*, Cambridge, MA.
2. **Shiozawa, K.**, Sugimoto-Dimitrova, R., Gruben, K. G., and Hogan, N., 2024, “Human Foot Force Reveals Different Balance Control Strategies between Healthy Younger and Older Adults,” Poster presentation at the *2024 Neural Control of Movement Conference*, Dubrovnik, Croatia.
3. **Shiozawa, K.**, Russo, M., Lee, J., Hogan, N., and Sternad, D., 2023, “Foot Force Informs Neural Control Strategies of Different Quiet Balance Conditions.” Poster presentation at the *2023 Society for Neuroscience Conference*, Washington D.C.
4. **Shiozawa, K.**, Hogan, N., 2023, “Altered Ground Reaction Force Following Stroke Informs Neural Control of Quiet Balance.” Poster presentation at the *2023 MIT Mechanical Engineering Research Exhibition*, Cambridge, MA.
5. **Shiozawa, K.**, Russo, M., Lee, J., Hogan, N., and Sternad, D., 2023, “Foot Force Informs Neural Control Strategies of Quiet Balance.” PowerPoint and poster presentation at the *2023 Neural Control of Movement Conference*, Victoria, BC, Canada.
6. **Shiozawa, K.**, Lee, J., Russo, M., Sternad, D., and Hogan, N., 2021, “Foot Force Informs Neural Control Strategies of Quiet Balance.” Poster presentation at the *2021 MIT Mechanical Engineering Research Exhibition*, Cambridge, MA.
7. **Shiozawa, K.**, Lee, J., Russo, M., Sternad, D., and Hogan, N., 2021, “Frequency-Dependent Force Direction Elucidates Neural Control of Balance.” Poster presentation at the *2021 Neural Control of Movement Conference*, Virtual.
8. **Shiozawa, K.**, Lee, J., Russo, M., Sternad, D., and Hogan, N., 2021, “Frequency-Dependent Force Direction Elucidates Neural Control of Balance.” Poster presentation at the *CRA-WP Grad Cohort for Women Conference*, Virtual.

## Conference Presentations (cont.)

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9. **Shiozawa, K.**, Lee, J., Russo, M., Sternad, D., and Hogan, N., 2020, “Modeling Frequency-Dependent Human Balance.” Poster presentation at the *2020 MIT Mechanical Engineering Research Exhibition*, Virtual.
10. **Shiozawa, K.**, Lee, J., Russo, M., Sternad, D., and Hogan, N., 2020, “Frequency-Dependent Force Direction Elucidates Neural Control of Balance.” PowerPoint presentation at the *2020 Neuromatch Conference*, Virtual [[Link](#)].

## Invited Talks

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1. “Quantifying Human Balance Control and Performance to Inform Therapy,” Neuromechanics Lab (Prof. Lena Ting), Emory University and Georgia Institute of Technology, June 28, 2024 [[Link](#)].
2. “Human Foot Force Informs Neural Control Strategies of Quiet Balance,” Mechanical Systems Control Lab (Prof. Masayoshi Tomizuka), U.C. Berkeley, October 6, 2023.
3. “Understanding Human Neuromotor Control: All Models are Wrong, Simple Models are Useful,” Neurobionics Engineering Club, Camplus College, May 4, 2023 [[Link](#)].
4. “Towards The Development of An Adaptive Balance Rehabilitation Device,” MIT SENSE.nano Symposium, December 1, 2021 [[Link](#)].
5. “Converging Healthcare, Robotics, and AI,” Accenture, April 29, 2021.

## Supervision Experience

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### Max Burns

Sept. 2022 – Jun. 2024

Department of Mechanical Engineering, MIT

- Supervised student to design and conduct human subject experiments, develop and validate a predictive algorithm for a balance performance measure, and analyze human experimental results
- **Burns, M.**, Shiozawa, K. \*, Hogan, N., 2024, “Evaluation of Quiet Standing with an Instrumented Cane,” *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, under review. \*Corresponding Author
- Student selected for SuperUROP (Advanced Undergraduate Research Opportunities Program)
- Student selected for the Prince Innovation Prize for filing a patent

### Billal Iqbal

Jan. 2022

Departments of Mechanical Engineering and Electrical Engineering and Computer Science, MIT

- Supervised student to design and conduct human subject experiments

### Emily Skilling

Sept. 2019 – Aug. 2020

Department of Mechanical Engineering, MIT

- Supervised student to design and conduct human subject experiments, instrument a cane with force and motion sensors, characterize the sensors, and analyze human experimental data
- Student selected for SuperUROP (Advanced Undergraduate Research Opportunities Program)
- **Skilling, E.**, 2020, “Instrumentation System for Balance Device Design Validation,” Undergraduate Thesis.
- Student won the John C. and Elizabeth J. Chato (Excellence in Bioengineering) Award

## Teaching Experience

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### Kaufman Teaching Certificate Program

Sept. 2024 – Present

*Massachusetts Institute of Technology, Teaching + Learning Lab*

- Developing foundational skills in course design, focusing on student-centered teaching and active learning
- Applying evidence-based pedagogical strategies to create inclusive and engaging learning environments
- Designing assessments and delivering constructive feedback that promotes student growth
- Practicing techniques for facilitating critical thinking and problem-solving in engineering courses

### Grader

2016 – 2020

*Massachusetts Institute of Technology,*

*2.001 Mechanics & Materials I, 2.003 Dynamics & Controls I, 2.12 Intro to Robotics*

### Lab Assistant

Feb. – May 2019

*Massachusetts Institute of Technology, 2.00b Toy Product Design*

- Mentored a team of freshmen for the design of a new toy, guiding them in ideation, prototyping, and building
- Provided hands-on support with design tools and techniques, including CAD, 3D printing, electronics and software programming, and material selection
- Fostered a collaborative learning environment, encouraging creative problem-solving and iterative design
- Assisted students in preparing a final presentation and product showcase

## Work Experience

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### Microsoft Corporation

Seattle, WA

*Program Manager Intern*

June – Aug. 2019

- Filed patent and drove adoption for anomaly detection in Azure cloud access management product
- Organized meetings with key users to create a specification for the product tailored to the users' needs
- Presented to senior leadership and won best presentation display

### Lockheed Martin Advanced Technology Center

Palo Alto, CA

*Mechanical Structural/Robotics Engineer Intern*

June – Aug. 2018

- Conducted vibration analysis verifying the integrity of 3 high value PCBs to withstand spacecraft launch
- Implemented code to remotely control waypoint-navigating robots; designed 3D printed processor board mounts consisting of a clip, removing the need for fasteners
- Presented findings to 30+ executives and colleagues

### Haemonetics Corporation (Medical Devices)

Braintree, MA

*Mechanical Design Engineer Intern*

June – Aug. 2017

- Devised optical sensor components to improve blood separation; worked in the blood-lab to test and characterize
- Collaborated with software, mechanical, and systems engineering teams to explore costs and manufacturability of various sensing techniques, while gaining hands-on experience in rapid prototyping
- Presented to 20 company executives, project managers, and colleagues

## Skills

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**Programming:** Python, MATLAB, Swift, Arduino, HTML, C++, Machine Learning, Drake

**Hardware Prototyping:** Lathe, Mill, Welding, Laser Cutting, Water Jetting, 3D Printing

**Software:** SolidWorks, Fusion360, GitHub, Latex, Adobe Photoshop, Adobe Illustrator, Visual Studio, Microsoft Office

**Spoken Languages:** English (fluent), Japanese (fluent), French (business), Mandarin Chinese (basic)

## Leadership and Community Service

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### MIT Women's Technology Program in Mechanical Engineering

Jul. 2024

*Mentor*

- Mentored high school students on their poster presentations analyzing a real-world engineering problem

### MIT Institute Committee: Community Service Fund Board

Aug. 2020 – Present

- Nominated by the Graduate Student Council; selecting charitable organizations that MIT supports financially with an annual budget of ~\$70,000

### Assistive Technology MIT

Sept. 2023 – May. 2024

*Mentor*

- Mentored an undergraduate student team developing a robotic feeder alongside a user that has limited mobility

### MIT MEGAWomen (Mechanical Engineering Graduate Women)

Feb. 2021 – Apr. 2024

*Executive Co-Chair; Media & Publicity Co-Chair (previously)*

- Applied for and managed a fund of ~\$6,000
- Organized collaboration across social, professional development, and diversity & inclusion sub-committees

### MIT Shotokan Karate Club

Feb. 2016 – Feb. 2021

*President*

- Organized club events and practices and collaborated with instructors and mentors using a budget of \$2000/year
- Placed 1<sup>st</sup> in the Harvard-MIT Shotokan Cup; Top 8 in Japan Nationals; Placed 3<sup>rd</sup> in All-Tokyo Regionals
- Obtained black belt

### MIT Mechanical Engineering Diversity, Equity, and Inclusion Working Group

June 2020 – Aug. 2020

- Collaborated with students and administration to create a proposal on how the department could improve in diversity, equity, and inclusion

### Pi Tau Sigma: National Mechanical Engineering Honor Society

Mar. 2018 – May 2019

*Professional Development Coordinator*

- Organized information sessions on graduate school and student-faculty lunches using a budget of \$10,000+

### Japanese Society of Undergraduates

Aug. 2016 – Jan. 2019

*Treasurer*

- Organized cultural activities using a budget of \$700/semester to garner interest in Japanese culture
- Designed new website [[Link](#)]

### Freshman Pre-Orientation Program: Discover Product Design at MIT

Aug. 2016 – 2018

*Co-coordinator & Mentor*

- Managed a budget of \$7,000 as coordinator and collaborated with MIT faculty to organize the entire program that hosts 20 incoming freshmen and ~15 mentors
- Mentored incoming students in a weeklong program introducing them to ideation, prototyping, and CAD

## Professional Service

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### Conference Paper Review

- IEEE International Conference on Robotics and Automation (ICRA)

### Journal Paper Review

- IEEE Transactions on Neural Systems & Rehabilitation Engineering (TNSRE)
- IEEE Robotics and Automation Letters (RA-L), Young Reviewer
- Journal of Biomechanics, Assisted Prof. Hogan with review

## Professional Development

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<b>Rising Stars in Mechanical Engineering</b> , Berkeley, CA	2023
<b>MIT Path of Professorship</b> , Cambridge, MA	2021
<b>Computing Research Association Grad Cohort for Women</b> , Virtual	2021
<b>Biomedical Science Careers Student Conference</b> , Virtual	2021
<b>MIT Women in Innovation and STEM Database (WISDM)</b>	2020
<b>Pi Tau Sigma National Mechanical Engineering Honor Society</b>	2018
<ul style="list-style-type: none"><li>• Top 25% of class eligible for membership</li></ul>	

## In the News

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“From counting blood cells to motion capture, sensors drive patient-centered research,” MIT News, Dec. 15, 2021 [Link].

“Advancing industry convergence through technology and innovation,” MIT News, July 30, 2021 [Link].

“MIT wins spring 2017 International Karate Shotokan Cup,” The Tech, Apr. 27, 2017 [Link].

“Imbalance in Japan’s economy,” The Japan Times, Mar. 29, 2012 [Link].