John H. Bell, Ph.D.
Cambridge, MA | jhbell@mit.edu | (252) 295-8876 | johnhbell.github.io

Education

MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)

Doctor of Philosophy in Mechanical Engineering, with a Minor in Applied Mathematics May 2025

- Dissertation: "Dynamic modeling and intervention design for the sit-to-stand transition using Koopman lifting linearization" (Advisor: H. Harry Asada)
- Cumulative GPA: 5.0/5.0
- Selected Coursework: 2.160 Identification, Estimation, and Learning, 2.183 Neural Control of Movement, 6.438 Algorithms for Inference, 2.737 Mechatronics

Master of Science in Mechanical Engineering June 2020

- Thesis: "A two-motor actuator for legged robotics applications" (Advisor: H. Harry Asada)
- Cumulative GPA: 5.0/5.0
- Selected Coursework: 2.737 Mechatronics, 2.720 Elements of Mechanical Design, 6.832 Underactuated Robotics, 16.32 Optimal Control & Estimation

Bachelor of Science in Mechanical Engineering, with a Minor in Philosophy June 2018

- Thesis: "Non-invasive system identification of a tactical generator" (Advisor: Marija Ilić)
- Cumulative GPA: 5.0/5.0
- Robotics/Controls Coursework: 2.140 Analysis and Design of Feedback Control Systems, 2.120 Introduction to Robotics, 2.003/2.004 Dynamics and Controls I and II, 2.007 Design and Manufacturing I
- Department Award: Ernest Cravalho Award for Outstanding Performance in Thermal Fluids Engineering (2015)

Teaching and Advising

MIT DEPARTMENT OF MECHANICAL ENGINEERING (MECHE)

2.160 (Identification, Estimation, and Learning) Teaching Assistant Sept – Dec, 2021, 2022, & 2024

- Assisted students better understand and apply the class material both through regular office hours and impromptu study sessions
- Taught recitation sessions and facilitated student discussion in these sessions
- Designed a class project for teaching Simultaneous Localization and Measurement (SLAM) to graduate students, and integrated student feedback to improve the lab assignment for the next year of students

2.12/2.120 (Introduction to Robotics) Lecture Teaching Assistant Feb – May 2024

- Organized, designed, and taught recitation sessions to reinforce techniques for solving problem sets
- Assisted students in developing their understanding through regular office hours
- Implemented a "mud card" student feedback system and prior knowledge polls to adapt lecture and recitation content to student needs in real time
- Led a team of graders by standardizing rubrics and grading techniques across assignments

2.00B (Toy Product Design) Section Instructor Feb – May 2023

- Facilitated a section of 6 students in applying the user-focused product design process to toy design
- Taught students how to use machine tools safely and effectively, and supervised students in the machine shop to ensure safety
- Advised students in the design of quick prototypes which could be tested experimentally to promote or discourage future directions of design
- Guided students in testing their prototypes with children and using their feedback to make decisions

2.S977 IAP Computer-Aided Design Class (MechE Special Subject) Instructor January 2021
- Worked with a team of MIT MakerWorkshop student mentors to organize and teach remote class in computer-aided design, geared toward undergraduate MechE students

Pappalardo Apprentice / 2.007 (Design and Manufacturing I) Undergraduate Shop Assistant Feb – May, 2017 & 2018
- Assisted 2.007 lab instructors in teaching lab and demonstrating to students design techniques and best practices
- Offered guidance to students in making design decisions and in implementing their design ideas in the machine shop
- Facilitated logistics for 2.007 lab as a whole, both by managing materials/supplies and by ensuring shop safety

2.12/2.120 (Introduction to Robotics) Undergraduate Lab Assistant Sept – Dec 2017
- Assisted 2.12/2.120 lab instructor and graduate TAs in running labs and executing the class's final competition
- Helped students and teams directly in understanding subject matter and debugging technical issues

MIT CONCOURSE FIRST-YEAR LEARNING COMMUNITY

Philosophy Seminar Teaching Assistant — CC.010 and CC.011 Sept 2015 – Dec 2016
- Lead group discussions in a variety of philosophical topics, including perception, politics, ethics, and knowledge
- Organized group assignments for seminar and managed related logistics for teaching team

First Year Physics (Mechanics and EM) Teaching Assistant — CC.801(2) and CC.802(2) Sept 2015 – June 2016
- Led recitation sections, demonstrating problem solution techniques and answering student questions
- Held office hours to assist with problem sets and general understanding of physics
- Graded problem sets and provided feedback to students on how to improve their problem-solving methods

Associate Advisor Sept 2015 – June 2016
- Helped first-years in Concourse select classes and gave general advice on how to manage the first year
- Assisted the advisors of Concourse in organizing and executing group activities for the students

Research and Engineering Work

GENTLECARE

Research Scientist June 2025 – present
- Design soft robotic actuators to assist nurses in repositioning of elderly patients in nursing homes
- Lead a team of engineers in validating prototypes in the context of functional requirements
- Advise team of engineers in the development of multi-modal control systems and pneumatic systems

MIT DEPARTMENT OF MECHANICAL ENGINEERING: D'ARBELOFF LAB

PhD Candidate June 2020 – May 2025
- Designed force-based intervention to assist elderly people in the sit-to-stand motion
- Developed novel Koopman lifted linear models to characterize the autonomous dynamics of human sit-to-stand motion, specifically in elderly people
- Performed experiments on humans to analyze how they respond to movement assistance by a human or a robot

Graduate Research Assistant (Master of Science) Aug 2018 – June 2020

- Developed novel methods to combine commercial off-the-shelf motors to achieve multiple modes of interaction with elderly users of a support robot
- Designed methods of high-speed / high-torque switching control for a dual-motor actuator

MIT LINCOLN LABORATORY — GROUP 73: ENERGY SYSTEMS

Undergraduate Researcher June 2017 – June 2018

- Designed and executed experiments to develop dynamical system model for synchronous machine electric generator
- Applied frequency-domain and time-domain analysis to study stability of microgrids containing synchronous machines and renewables

MIT DEPARTMENT OF MECHANICAL ENGINEERING — TURITSYN LAB

Undergraduate Researcher Feb 2016 – Jan 2017

- Developed stochastic differential equation models to simulate power grid systems with wind power penetration
- Applied Fokker-Planck probabilistic analysis to study frequency stability of grids with primary control and deadbands

MIT DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING — CARTER LAB

Undergraduate Researcher June – Aug 2015

- Synthesized mathematical model for shape-deformation of metal surfaces due to the variations in surface tension
- Applied numerical PDE solution methods to study time-evolution of such metal systems

NORTH CAROLINA STATE UNIV., DEPT. OF CHEMICAL AND BIOMOLECULAR ENG.— DICKEY LAB

Research Assistant June 2013 – Feb 2014

- Collaborated with research team to develop new project studying shape-reconfigurable liquid-metal patterning methods
- Designed tools and techniques for creating and patterning liquid-metal films using electrolysis

Leadership and Service

MIT TEACHING AND LEARNING LAB (TLL)

Mechanical Engineering (MechE) Teaching Development Fellow June 2022 – May 2023

- Organized social events for MechE's teaching assistants to meet each other and discuss challenges they face in the teaching efforts
- Served as a liaison between the MechE's teaching assistants and the MIT administration, including the MechE department leadership and the MIT Corporation (MIT's board of trustees)
- Organized and taught seminars on educational scaffolding and the use of clear communication to enable inclusive teaching

MIT MAKERWORKSHOP MAKERSPACE

President June 2019 – May 2020

- Led executive committee in managing the week-to-week operations of the machine shop and facilitating its student community
- Served as a liaison between the student mentors of MakerWorkshop and the MIT administration and faculty
- Negotiated with the MIT Aeronautics and Astronautics (AeroAstro) and MechE departments to expand user access of MakerWorkshop beyond MechE students and faculty, to include AeroAstro students and faculty as well
- Oversaw a team of student mentors in the development of an experimental mentor-taught IAP course in computer-aided design (CAD), targeted at MechE sophomores. This class was successfully test-run in IAP 2020, and is being offered as a 3-credit class in IAP 2021 as 2.S977.
- Led various teams of student mentors in organizing and running social and outreach events to promote inclusivity in the student community
- Worked with a team of student mentors to adapt social and outreach events in the latter half of Spring 2020 from in-person events held in the makerspace to virtual events held remotely

CNC Router Machine Master June 2016 – May 2019 and May 2021 – Aug 2023

- Organize CNC Router Team in maintaining the CNC router machine and giving trainings to MakerWorkshop users and mentors
- Develop new training procedures for teaching students, staff, and faculty how to use the CNC router

Mentor Dec 2015 – Aug 2023

- Teach and supervise users of the MakerWorkshop makerspace in usage of machine tools to produce projects
- Offer comprehensive trainings to users of the MakerWorkshop makerspace on the use of the CNC router

MIT ASHDOWN HOUSE

Events Committee Chair June 2020 – Dec 2021

- Led a team of graduate student volunteers in planning and running a variety of remote and in-person events
- Developed methods of distribution of food and resources to event participants that emphasized physical distancing and stringent sanitary precautions
- Coordinated with MIT groups such as the Graduate Student Council to apply for event funding and submit event reports
- Planned and oversaw Ashdown House's systems for event compliance with MIT COVID policies, enabling students to reconnect in a safe manner

Events Committee Officer Jan 2020 – Jan 2023

- Organized regular puzzlehunting events for all graduate students
- Designed and implemented puzzlehunts for these puzzlehunting events

Professional Training

MIT TLL GRADUATE TEACHING CERTIFICATE PROGRAM

Graduate Teaching Practice Student Jun 2020 – Jun 2023

- Studied modern teaching principles of lesson planning, course design, and inclusive teaching
- Applied modern teaching principles to the development of a proposal for a class which utilizes real-life applications to teach elements of sensor characterization and state estimation

MIT MECHE GROUP COACHING PROGRAM

Group Coaching Participant / Coaching Student Sept – Dec 2021

- Learned and practiced key skills of coaching and active listening from a certified coaching instructor
- Worked with a small group of four students to coach each other in the context of a variety of real issues that we were encountering in our personal and professional lives, under the advisory of the coaching instructor

Publications

R. Tejwani, **J. Bell**, D. Elliott, C. Wright, P. Wayne, P. Bonato, and H. Asada, "Spring Loaded Double Pantograph: A Robotic Mechanism for Safe Balance Training," *2025 IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)*, Eindhoven, Netherlands, 2025, publication pending.

J. Bell and H. Harry Asada, "Monitoring the Mental State of Cooperativeness for Guiding an Elderly Person in Sit-to-Stand Assistance," *2022 International Conference on Robotics and Automation (ICRA)*, Philadelphia, PA, USA, 2022, pp. 6465-6471, doi: 10.1109/ICRA46639.2022.9812422.

J. Bell, E. Kamienski, S. Teshigawara, H. Itagaki and H. H. Asada, "Gear Ratio Optimization of a Multifunctional Walker Robot Using Dual-Motor Actuation," 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Prague, Czech Republic, 2021, pp. 9339-9346, doi: 10.1109/IROS51168.2021.9636482.

J. Bell and H. H. Asada, "Design and Time-Optimal Control of a High-Speed High-Torque Dual-Motor Actuator," 2020 American Control Conference (ACC), Denver, CO, USA, 2020, pp. 1017-1024, doi: 10.23919/ACC45564.2020.9147873.

P. Vorobev, D. M. Greenwood, **J. H. Bell**, J. W. Bialek, P. C. Taylor and K. Turitsyn, "Deadbands, Droop, and Inertia Impact on Power System Frequency Distribution," in IEEE Transactions on Power Systems, vol. 34, no. 4, pp. 3098-3108, July 2019, doi: 10.1109/TPWRS.2019.2895547.

Khan, M. R., **Bell, J.**, Dickey, M. D. (2016). Localized Instabilities of Liquid Metal Films via In-Plane Recapillarity. *Adv. Mater. Interfaces*, 3: 1600546. doi: 10.1002/admi.201600546