

# Monroe D. Kennedy III, Ph.D.

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Curriculum vitae last updated: December 1, 2023

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## Education

**Ph.D. 2019** Mechanical Engineering Applied Mechanics, University of Pennsylvania  
Dissertation: Modeling and Control for Robotic Assistants: Single and Multi-robot Manipulation  
**M.S. 2016** Robotics, University of Pennsylvania  
**B.S. 2012** Mechanical Engineering, University of Maryland Baltimore County  
**A.S. 2006** Cuyahoga Community College

## Positions Held

- **2019-present** Assistant Professor, Mechanical Engineering Department, Stanford University
- **2021-present** Courtesy appointment, Computer Science Department, Stanford University
- **2019** Technical Staff in Group 76, MIT Lincoln Laboratory

## Research Interests

My research focuses on developing principles and tools needed to realize collaborative robotics (human-robot collaboration), robotic autonomy and robotic manipulation. Topics that are of particular interest to me include: (1) Robotic Assistants: collaborative robots that work for or alongside human teammates and require modeling of complex tasks and (human) teammate behavior. (2) Connected Devices: passive robotic platforms that enhance an ability of the human user and leverage situational awareness to assist and predict the human users needs. (3) Intelligent Wearables: devices that either augment or enhance a humans ability and is worn on the individual, such devices require situational awareness, and prediction of users intent and actions in order to serve the human users needs. Solutions rely on combination of tools in dynamical systems analysis, control theory (classical, non-linear and robust control), state estimation and prediction, motion planning, vision for robotic autonomy and machine learning. Application areas include autonomous assistive technology, robotic assistants with the goal of deployment for service tasks that may be highly dynamic and require dexterity, situational awareness, as well as human-robot collaboration.

## Awards and Certificates

- National Science Foundation Faculty Early Career Development (CAREER) Award - Foundational Robotics Research (FRR), CMMI. Award number [2142773](#).
- National Science Foundation Graduate Fellow [University of Pennsylvania]
- GEM Fellow [University of Pennsylvania]
- Outstanding Teaching Assistant Award in Mechanical Engineering [University of Pennsylvania]
- Center for Teaching and Learning (CTL) Teaching Certificate [University of Pennsylvania]
- Meyerhoff Scholar [University of Maryland, Baltimore County]
- Tau Beta Pi Honors Society [University of Maryland, Baltimore County]

## Journal Articles

- [1] Jose A Solano-Castellanos, Won Kyung Do, and **Monroe Kennedy III**. Embedded object detection and mapping in soft materials using optical tactile sensing. *arXiv preprint arXiv:2308.11087*, 2023. (submitted).
- [2] Won Kyung Do, Bianca Aumann, Camille Chungyoun, and **Monroe Kennedy**. Inter-finger small object manipulation with densetact optical tactile sensor. *IEEE Robotics and Automation Letters*, 9(1):515–522, 2024.

- [3] Eley Ng, Ziang Liu, and **Monroe Kennedy**. Diffusion co-policy for synergistic human-robot collaborative tasks. *IEEE Robotics and Automation Letters*, 9(1):215–222, 2024.
- [4] **Monroe Kennedy**, Karl Schmeckpeper, Dinesh Thakur, Jiang Chenfanfu, Vijay Kumar, and Kostas Daniilidis. Autonomous precision pouring from unknown containers. *IEEE Robotics and Automation Letters*, 4(3):2317–2324, 2019.
- [5] Caio Mucchiani, **Monroe Kennedy**, Mark Yim, and Jun Seo. Object picking through in-hand manipulation using passive end-effectors with zero mobility. *IEEE Robotics and Automation Letters*, 3(2):1096–1103, April 2018.
- [6] **Monroe Kennedy**, Dinesh Thakur, M Ani Hsieh, Subhrajit Bhattacharya, and Vijay Kumar. Optimal paths for polygonal robots in se (2). *Journal of Mechanisms and Robotics*, 10(2):021005, 2018.
- [7] Edward Steager, Mahmut Selman Sakar, Magee Ceridwen, **Monroe Kennedy**, Anthony Cowley, and Vijay Kumar. Automated biomanipulation of single cells using magnetic microrobots. *The International Journal of Robotics Research*, 32(3):346–359, 2013.

## Refereed Conference Articles

- [1] Won Kyung Do, Ankush Kundan Dhawan, Mathilda Kitzmann, and **Monroe Kennedy**. Densetact-mini: An optical tactile sensor for grasping multi-scale objects from flat surfaces. *arXiv preprint arXiv:2309.08860*, 2023.
- [2] Won Kyung Do, Bianca Jurewicz, and **Monroe Kennedy**. Densetact 2.0: Optical tactile sensor for shape and force reconstruction. In *2023 IEEE International Conference on Robotics and Automation (ICRA)*, pages 12549–12555, 2023.
- [3] Eley Ng, Ziang Liu, and **Monroe Kennedy**. It takes two: Learning to plan for human-robot cooperative carrying. In *2023 IEEE International Conference on Robotics and Automation (ICRA)*, pages 7526–7532, 2023.
- [4] Weizhuo Wang, Michael Raitor, Steve Collins, C. Karen Liu, and **Monroe Kennedy**. Trajectory and sway prediction towards fall prevention. In *2023 IEEE International Conference on Robotics and Automation (ICRA)*, pages 10483–10489, 2023.
- [5] Won Kyung Do and **Monroe Kennedy**. Densetact: Optical tactile sensor for dense shape reconstruction. In *2022 International Conference on Robotics and Automation (ICRA)*, pages 6188–6194, 2022.
- [6] Albert H. Li, Philipp Wu, and **Monroe Kennedy**. Replay overshooting: Learning stochastic latent dynamics with the extended kalman filter. In *2021 IEEE International Conference on Robotics and Automation (ICRA)*, pages 852–858, 2021.
- [7] **Monroe Kennedy**, Kendall Queen, Dinesh Thakur, Kostas Daniilidis, and Vijay Kumar. Precise dispensing of liquids using visual feedback. In *2017 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 1260–1266, Sept 2017.
- [8] Mabel Zhang, **Monroe Kennedy**, M. Ani Hsieh, and Kostas Daniilidis. A triangle histogram for object classification by tactile sensing. In *2016 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 4931–4938, Oct 2016.
- [9] **Monroe Kennedy III**, Luis Guerrero, and Vijay Kumar. Decentralized algorithm for force distribution with applications to cooperative transport. In *ASME 2015 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, volume 5C: 39th Mechanisms and Robotics Conference of *International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*. American Society of Mechanical Engineers, Aug 2015. V05CT08A013.

## Editorials/Invited/Non-refereed/Short Conference Articles and Abstracts

- [1] Monroe Kennedy. The role of collaborative robotics in assistive and rehabilitation applications. *Science Robotics*, 8(83):eadk6743, 2023.
- [2] Eley Ng, Ziang Liu, and **Monroe Kennedy**. Learning action and state sampling distributions from offline data for human-robot collaboration. In *Workshop on Learning from Diverse, Offline Data*, 2022.

- [3] Shivani Guptasarma and **Monroe Kennedy III**. Considerations for the Control Design of Augmentative Robots. In *IEEE International Conference on Intelligent Robots and Systems Workshop on Building and Evaluating Ethical Robotic Systems*, number 1, Prague, Czech Rep, 2021.
- [4] Ayanna Howard and **Monroe Kennedy III**. Robots are not immune to bias and injustice. *Science Robotics*, 5(48), Nov 2020.
- [5] Junwu Zhang and **Monroe Kennedy**. Recent development in human motion and gait prediction. *Workshop on Robot Retrospectives, Robot Science and Systems*, 2020.
- [6] Monroe David Kennedy III. *Modeling and Control for Robotic Assistants: Single and Multi-Robot Manipulation*. Phd, University of Pennsylvania, jan 2019.

## Professional Service

### *International Program, Editorial, and Review Committees*

- Reviewer for IEEE Transactions on Instrumentation & Measurement 2023
- Associate Editor for IEEE International Conference on Robotics and Automation (ICRA) 2020,2022,2023
- Conference Session Chair (Contact Modeling, Grippers, and other End-Effectors), IEEE ICRA 2022
- Reviewer for IEEE Transactions on Neural Systems and Rehabilitation Engineering 2022
- Reviewer for IEEE International Conference on Robotics and Automation (ICRA) 2020-2023
- Workshop Program Committee (Building and Evaluating Ethical Robotics Systems), IEEE International Conference on Intelligent Robots and Systems (IROS) 2021
- Conference Session Chair (Automation: Machine Learning II), IEEE ICRA 2021
- Reviewer for Transactions on Human-Robot Interaction 2021
- Guest Editor for Field Robotics: *Robotics Collaborative Technology Alliance (RCTA)– Developing Autonomous Robotic Team Members for Unstructured Environments* 2020-2021
- Reviewer for International Journal of Robotics Research 2019
- Reviewer for IEEE International Conference on Automation Science and Engineering (CASE) 2018
- Reviewer for ASME International Design Engineering Technical Conferences 2017-2018
- Reviewer for IEEE Robotics and Automation Letters (RA-L) 2017 - 2023 (every year)
- Reviewer for IEEE International Conference on Intelligent Robots and Systems (IROS) 2014-2016

### *Administrative and Organizational Committees*

- [Black in Robotics](#) (non-profit) co-founder, board member, National co-Director and Bay Area Chapter co-Director 2020-present

## University Service

Graduate Admissions Committee, Department of Mechanical Engineering (2019-present)  
 Knight-Hennessy Scholar Annual Candidate Interviewer, Stanford University (2020-present)  
 Diversity, Equity and Inclusion Committee, Department of Mechanical Engineering (2020-2022)  
 Co-lead of Robotics and Autonomous Systems Area, SystemX Stanford University, (2020-present)

## Professional Affiliations

- Member, American Society of Mechanical Engineers
- Member, Institution of Electrical and Electronic Engineers

## Press Coverage and Media Appearances

- [Why the Future Needs Robots with a Human Touch](#)
- [KUKA Innovation award Finalist 2018](#)
- [Exploration Earth 2050 “Bio-Mechanimals” \(S1E1\)](#)
- [Bloomberg Technology: “The End of Traffic: How the Smartest People in the World Are Fixing Your Commute”](#)
- [Xploration Nature Knows Best \(S1E12\)](#)

## Advising

### Doctoral and Pre-doctoral Students

Eley Ng, Ph.D. student, Stanford Mechanical Engineering, expected 2023. NSF Graduate Fellow.

Shivani Guptasarma, Ph.D. student, Stanford Mechanical Engineering, expected 2025. Knight-Hennessy Scholar  
 Won Kyung Do, Ph.D. student, Stanford Mechanical Engineering, expected 2025.  
 Aliyah Smith, Ph.D. student, Stanford Aeronautics & Astronautics, expected 2025. NSF Graduate Fellow.  
 Weizhuo (Ken) Wang, M.S. in Aeronautics & Astronautics, Stanford University, expected 2026.

## Masters Research Students

\*=publication

Camille Chungyoun\*, M.S. in Mechanical Engineering, Stanford, expected 2024  
 Rafael Sonderegger, M.S. in Mechanical Engineering, ETH Zurich, Fall 2023  
 HongHao Zhen, M.S. in Mechanical Engineering, Stanford University, expected 2024  
 Heidi Kwong, M.S. in Mechanical Engineering, Stanford University, expected 2024  
 Karina Ting, M.S. in Mechanical Engineering, Stanford University, expected 2024  
 Tejas Deo, M.S. in Mechanical Engineering, Stanford University, expected 2024  
 Jose Castellanos\*, M.S. in Mechanical Engineering, Stanford University, expected 2024  
 Saksham Consul, M.S. in Mechanical Engineering, Stanford University, expected 2024  
 Dev Savla, M.S. in Mechanical Engineering, Stanford University, expected 2024  
 Bianca Jurewicz\*\*, M.S. in Mechanical Engineering, Stanford University, expected 2023  
 Ziang Liu\*, M.S. in Computer Science, Stanford University, expected 2023  
 Blair Huang, M.S. in Mechanical Engineering, Stanford University, expected 2023.  
 Albert Li\*, M.S. in Mechanical Engineering, Stanford University, graduated 2021.  
 Gabriela Bravo Illanes, M.S. in Mechanical Engineering, Stanford University, graduated 2021.  
 Luciana Frazao, M.S. in Mechanical Engineering, Stanford University, graduated 2021.  
 Ewurama Nyarkoah Karikari, M.S. in Mechanical Engineering, Stanford University, graduated 2021.  
 Junwu Zhang\*, M.S. in Mechanical Engineering, Stanford University, graduated 2021.  
 Alexander Maynard, M.S. in Aeronautics & Astronautics, Stanford University, graduated 2021.  
 Moromoke Adekanye, M.S. in Mechanical Engineering, Stanford University, graduated 2021.  
 Holly Dinkel, M.S. in Aeronautics & Astronautics, Stanford University, graduated 2020.  
 Manuel Retana, M.S. in Aeronautics & Astronautics, Stanford University, graduated 2020.  
 Richie Ling, M.S. in Mechanical Engineering, Stanford University, graduated 2020.

## Undergraduate Students

Undergraduate Research is performed for course credit, pay (either through an REU supplement to an NSF grant or from the ME Department SURF program), or volunteer participation. This is a list of undergraduates who have performed research in the ARMLab: Ankush Kundan (Fall 2022), Mathilda Kitzmann (Fall 2022), Beck Jurasius (Winter 2022- Summer 2022) James Kelly (Winter 2020- Winter 2022), Bryn Hughes (Summer 2020 - Summer 2021), Rekha Ramanathan (Summer 2020 - Winter 2021), Ashley Marie Lowber (Autumn 2020 - Spring 2021), Beck Jurasius (from Winter 2022),

## Research Experience for Teachers (RET)

At Stanford University: (through the program Ignited education) Suporn Chenhansa from Ohlone College (Summer 2020, 2021)

At the University of Pennsylvania: (through NSF funded RET) David Devard (science teacher at the School District of Philadelphia) (Summer 2017). Elissa Goldberg School Librarian at School District of Philadelphia (Summer 2016, 2017).

## Ph.D. Thesis Defense and Reading Committees

*Thesis Defenses:*

2019: Margaret Koehler (Stanford, ME)

2020: Jooyeun Ham (Stanford, ME)

2021: Alex Grubele (Stanford, ME), Raunak Bhattacharyya (Stanford, AA, dissertation chair), Vincent Chiu (Stanford, ME), Benoit Landry (Stanford, AA), Boris Ivanovic (Stanford, AA, dissertation chair), Kunal Menda (Stanford, AA), Gwen Bryan (Stanford, ME), Wilson Ruotolo (Stanford, ME), Adam Wiktor (Stanford, AA, dissertation chair), Xiaobai Ma (Stanford, AA, dissertation chair), Haruki Nishimura (Stanford, AA, dissertation chair), Joe Lorenzetti (Stanford, AA, dissertation chair), David Stonestrom (Stanford, AA), Shenli Yuan (Stanford, ME), Mingyu Wang (Stanford, ME).

2022: Apoorva Sharma (Stanford AA, dissertation chair), Adam Wilford Caccavale (Stanford, AA), Brian Axelrod (Stanford, CS, dissertation chair), Eric Jordan Gonzalez (Stanford, ME), Zhangjie Cao (Stanford, CS, dissertation chair), Taylor Howell (Stanford, ME), Zhangjie Cao (Stanford, CS, dissertation chair).

2023: Simon Pierre Marie Le Cleac'h (Stanford, ME), Catie Cuan (Stanford, ME), Brian Do (Stanford, ME), Marsie Trego Peterson (Stanford, ME), **Eley Ng** (Stanford, ME), Adyasha Mohanty (Stanford, AA, dissertation chair), Michael Andres Lin (Stanford, ME), Erez Krinsky (Stanford, ME), Oriana Claudia Peltzer (Stanford, AA), Nathaniel Agharese (Stanford, ME), Kenneth Hoffmann (Stanford, ME), Molly Zhang (Stanford, AA, dissertation chair).

*Reading Committees:* Elliot Weiss (Stanford, ME), Adrian Piedra (Stanford, CS), Marsie Trego Peterson (Stanford, ME), Michael Andres Lin (Stanford, ME), Adam Wilford Caccavale (Stanford, AA), Wilson Ruotolo (Stanford, ME), Gwen Bryan (Stanford, ME), Nathan Spielberg (Stanford, ME), Eric Jordan Gonzalez (Stanford, ME), Benoit Landry (Stanford, Aero-Astro), John Talbot (Stanford, ME), Shenli Yuan (Stanford, ME), Alex Grubele (Stanford, ME), Adam Caccavale (Stanford, AA), Michael Andres Lin (Stanford, ME), Max Sokolich (University of Delaware, ME), Simon Pierre Marie Le Cleac'h (Stanford, ME), Catie Cuan (Stanford, ME), Zhangjie Cao (Stanford, CS), Trevor Halsted (Stanford, AA, ME co-advisor), Nathaniel Agharese (Stanford, ME), Jasmin Palmer (Stanford, ME), William Chong (Stanford, ME), Trey Weber (Stanford, ME).

## Instruction and Course Development

**ME 334: Advanced Dynamics** Modeling and analysis of dynamical systems. This class will cover reference frames and coordinate systems, kinematics and constraints, mass distribution, virtual work, D'Alembert's principle, Lagrange and Hamiltonian equations of motion. We will then consider select topics in controls including: dynamical system stability, feedback linearization, system observability and controllability, and system identification methods. Students will learn and apply these concepts through homework and projects that involve the simulation of dynamical systems. *Stanford University: Spring 2020, 2021, 2022, 2023. Approximately 18 students per year.*

**ENGR 15: Dynamics** The application of Newton's Laws to solve 2-D and 3-D static and dynamic problems, particle and rigid body dynamics, free-body diagrams, and equations of motion, with application to mechanical, biomechanical, and aerospace systems. Computer numerical solution and dynamic response. *Stanford University: Autumn 2020, 2021. Approximately 35 students per year.*

**ME 326: Collaborative Robotics** This course focuses on how robots can be effective teammates with other robots and human partners. Concepts and tools will be reviewed for characterizing task objectives, robot perception and control, teammate behavioral modeling, inter-agent communication, and team consensus. We will consider the application of these tools to robot collaborators, wearable robotics, and latest applications in the relevant literature. This is a project-based graduate course, with implementation of algorithms in either python or C++. Recommended: Introductory course in machine learning. *Stanford University: Winter 2022, 2023. Approximately 19 students per year.*

## Invited Presentations

1. Princeton Mechanical and Aerospace Engineering (MAE) Seminar, Princeton, NJ, November 3, 2023
2. Bay Area Robotics Symposium, Stanford, CA, October 27, 2023
3. Society of Engineering Science 2023 Annual Technical Meeting, Soft Robotics Symposium, Minneapolis, MN, October 8, 2023
4. (Keynote) Amazon Science and Technology Summit, San Francisco CA, May 17, 2023
5. Berkeley Institute of Design (BiD) Seminar, Berkeley CA, April 26, 2023
6. [EI Seminar](#) at Massachusetts Institute of Technology (MIT), Boston MA, April 6, 2023
7. Robotics Seminar at Carnegie Mellon University, Pittsburgh PA, March 24, 2023
8. Robotics Seminar at West Virginia University, Morgantown WV, March 23, 2023
9. RCMAR 2023 Annual Meeting, (virtual), March 23, 2023
10. Bay Area Robotics Symposium, Berkeley, CA November 4, 2022
11. Robotics Seminar at Oregon State University, Corvallis OR, October 28, 2022
12. Institute for Experiential Robotics at Northeastern University Seminar Series, Boston, MA, October 19, 2022
13. (Guest Lecture) Harnessing AI for Breakthrough Innovation and Strategic Impact, Stanford, CA, July 19, 2022
14. ([Keynote](#)) Learning for Dynamics & Control Conference, Stanford, CA, June 24, 2022
15. Stanford Robotics Seminar, Stanford, CA, February 25, 2022
16. (Guest Lecture) SystemX/EE310, Stanford, CA, February 24, 2022
17. (Guest Lecture) Stanford Ignite, Stanford, CA, February 15, 2022
18. (Guest Lecture) Perspectives in Assistive Technology, Stanford, CA, February 10, 2022

19. CARS 2021 Annual Meeting, Stanford, CA, November 17, 2021
20. SystemX November Conference, Stanford, CA, November 11, 2021
21. Bay Area Robotics Symposium, Stanford, CA, October 29, 2021
22. University of Southern California CPS Seminar, October 6, 2021
23. ASME IDETC-CIE Special Early Career Session, August 17, 2021
24. GRASP Student Faculty Industry (SFI) Seminar Series, Philadelphia, PA, March 17, 2021
25. George Mason University Mechanical Engineering Department Seminar, Fairfax, VA, March 5, 2021
26. Human-Centered Artificial Intelligence (HAI) [Weekly Seminar](#), Stanford, CA, February 17, 2021
27. Berkeley DREAM/CPAR Seminar, Berkeley, CA, February 15, 2021
28. Human-Centered Interaction (HCI) Seminar, Stanford, CA, January 29, 2021
29. Bay Area Robotics Symposium, Stanford, CA, November 20, 2020
30. CARS 2020 Annual Meeting, Stanford, CA, November 11, 2020
31. SystemX November Conference, Stanford, CA, November 10, 2020
32. eWEAR Symposium, Stanford, CA, September 10, 2020
33. Bay Area Robotics Symposium, Berkeley, CA, November 15, 2019

## **Skills**

- Collaborative Robotics, Robotic Autonomy, Machine Learning, Computer Vision, Motion Planning, Dynamics and Controls Analysis, Numerical Optimization.
- *Programming Languages:* Python, C++ , Matlab
- *Applications:* TensorFlow, Pytorch, ROS, OpenCV, Solid Works, Eigen, Gurobi, L<sup>A</sup>T<sub>E</sub>X
- *Operating Systems:* Linux/Unix system, Robot Operating System (ROS)
- *Robots:* Kinova Gen3, Panda Franka Emika Manipulator, Allegro Hand, Fetch Mobile Manipulator, LocoBot, Rethink Robotics Baxter and Sawyer, Locobot, KUKA iiwa and YouBot, Scarab Differential Drive.