Stanford

Monroe Kennedy III

Assistant Professor of Mechanical Engineering and, by courtesy, of Computer Science

📄 NIH Biosketch available Online   📄 Curriculum Vitae available Online

Bio

BIO

Monroe Kennedy III is an Assistant Professor of Mechanical Engineering, with a courtesy appointment in Computer Science. He is the recipient of the NSF Career Award. He received his Ph.D. in Mechanical Engineering and Applied Mechanics, and a Masters in Robotics from the University of Pennsylvania where he was a recipient of both the NSF and GEM graduate research fellowships. His area of expertise is in collaborative robotics, specifically the development of theoretical and experimental approaches to enhance robotic autonomy and robotic effectiveness in decentralized tasks toward human-robot collaboration. He applies expertise in machine learning, computer vision, collaborative robot teammate intent estimation, dynamical systems analysis, control theory (classical, non-linear, and robust control), state estimation and prediction, and motion planning.

He is the director of the Assistive Robotics and Manipulation Lab (ARMLab) whose broad research objective is to develop technology that improves everyday life by anticipating and acting on the needs of human counterparts. ARMLab specializes in developing intelligent robotic systems that can perceive and model environments, humans, and tasks and leverage these models to predict system processes and understand their assistive role. The research can be divided into the following sub-categories: robotic assistants, connected devices, and intelligent wearables. ARMLab research requires the use of a 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, teammate intent estimation, and machine learning. ARMLab focuses heavily on both the analytical and experimental components of collaborative robotics. Research applications include autonomous assistive technology, robotic assistants (mobile manipulators and humanoids) with the goal of deployment for service tasks that may be highly dynamic and require dexterity, situational awareness, and human-robot collaboration.

ACADEMIC APPOINTMENTS

- Assistant Professor, Mechanical Engineering
- Assistant Professor (By courtesy), Computer Science
- Member, Bio-X
- Faculty Affiliate, Institute for Human-Centered Artificial Intelligence (HAI)
- Member, Wu Tsai Human Performance Alliance

HONORS AND AWARDS

- Faculty Early Career Award, National Science Foundation (February 24, 2022)
- Graduate Research Fellowship, National Science Foundation (2013-2018)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, American Society of Mechanical Engineers (2015 - present)

- Member, Institute of Electrical and Electronics Engineers (2016 - present)

PROGRAM AFFILIATIONS

- Center for Automotive Research at Stanford (CARS)

- Stanford SystemX Alliance

PROFESSIONAL EDUCATION

- PhD, University of Pennsylvania , Mechanical Engineering and Applied Mechanics (2019)

- MS, University of Pennsylvania , Robotics (2016)

- BS, University of Maryland, Baltimore County , Mechanical Engineering (2012)

COMMUNITY AND INTERNATIONAL WORK

- National Director for Black in Robotics

LINKS

- Assistive Robotics and Manipulation Lab: https://arm.stanford.edu

- Google Scholar: https://scholar.google.com/citations?user=x2ZPRfoAAAAJ&hl=en&oi=ao

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My research is to develop technology that improves everyday life by anticipating and acting on the needs of human counterparts. The research can be divided into the following sub-categories: robotic assistants, connected devices and intelligent wearables. I use a 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. My Assistive Robotics and Manipulation lab (arm.stanford.edu) focuses heavily on both the analytical and experimental components of assistive technology design. While our application area domain is autonomous assistive technology, our primary focus is robotic assistants (mobile manipulators and humanoids) with the goal of deployment for service tasks that may be highly dynamic and require dexterity, situational awareness, and human-robot collaboration.

Teaching

COURSES

2023-24

- Advanced Dynamics, Modeling and Analysis: ME 334 (Spr)

- Collaborative Robotics: CS 339R, ME 326 (Win)

- Dynamics: ENGR 15 (Aut)

2022-23

- Advanced Dynamics: ME 334 (Spr)

- Collaborative Robotics: CS 339R, ME 326 (Win)

2021-22

- Advanced Dynamics, Controls and System Identification: ME 334 (Spr)

- Collaborative Robotics: ME 326 (Win)

- Dynamics: ENGR 15 (Aut)

2020-21

- Advanced Dynamics, Controls and System Identification: ME 334 (Spr)

- Dynamics: ENGR 15 (Aut)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Dylan Asmar, Julia Di, Marion Lepert, Jasmin Palmer, Adrian Piedra, Gadi Sznaier Camps, Trey Weber, Elliot Weiss

Orals Chair

Somrita Banerjee, ADYASHA MOHANTY, Molly Zhang

Doctoral Dissertation Advisor (AC)

Won Kyung Do, Shivani Guptasarma, Aliyah Smith

Master's Program Advisor

Zahra Albasri, Omoruyi Atekha, Catherine Chen, Winnie Chen, Ankitha Durvasula, Aditya Dutt, Yunxin Fan, Romeo Garcia, Vishal Kackar, Derek Knowles, Joshua

Lee, Mark Leone, Gowri Yathishchandran Subedar, Austin Yang

Doctoral Dissertation Co-Advisor (AC)

William Chong, Chinmay Devmalya, Derek Knowles, Ken Wang

Doctoral (Program)

Nicholas Broadbent, Aaron Garza, Shivani Guptasarma, William Heap, Matt Strong, Aiden Swann

Publications

PUBLICATIONS

- **Inter-finger Small Object Manipulation With DenseTact Optical Tactile Sensor** *IEEE ROBOTICS AND AUTOMATION LETTERS*
  Do, W., Aumann, B., Chungyoun, C., Kennedy, M.
  2024; 9 (1): 515-522

- **The role of collaborative robotics in assistive and rehabilitation applications.** *Science robotics*
  Kennedy, M.
  2023; 8 (83): eadk6743

- **Trajectory and Sway Prediction Towards Fall Prevention.** *IEEE International Conference on Robotics and Automation : ICRA : [proceedings]. IEEE International Conference on Robotics and Automation*
  Wang, W., Raitor, M., Collins, S., Liu, C. K., Kennedy, M.
  2023; 2023: 10483-10489

- **DenseTact 2.0: Optical Tactile Sensor for Shape and Force Reconstruction**
  Do, W., Jurewicz, B., Kennedy, M.
  2023: 12549-12555

- **Diffusion Co-Policy for Synergistic Human-Robot Collaborative Tasks** *IEEE Robotics and Automation Letters*
  Ng, E., Liu, Z., Kennedy, M.
  2023: 1-8

- **Trajectory and Sway Prediction Towards Fall Prevention**
  Wang, W., Raitor, M., Collins, S., Liu, C., Kennedy, M.
  2023: 10483-10489

- **It Takes Two: Learning to Plan for Human-Robot Cooperative Carrying**
  Ng, E., Liu, Z., Kennedy, M.
  2023: 7526-7532

- **DenseTact: Optical Tactile Sensor for Dense Shape Reconstruction**

Do, W., Kennedy, M.

2022: 6188-6194

- **Replay Overshooting: Learning Stochastic Latent Dynamics with the Extended Kalman Filter** *IEEE International Conference on Robotics and Automation*

  Li, A. H., Wu, P., Kennedy, M.

  2021: 852-858

- **Considerations for the Control Design of Augmentative Robots**

  Guptasarma, S., Kennedy, M.

  IEEE IROS Workshop on Building and Evaluating Ethical Robotic Systems.

  2021

- **Robots are not immune to bias and injustice.** *Science robotics*

  Howard, A., Kennedy, M. 3.

  2020; 5 (48)

- **Recent Development in Human Motion and Gait Prediction**

  Zhang, J., Kennedy, M.

  RSS 2020 Workshop RobRetro.

  2020

- **Autonomous Precision Pouring From Unknown Containers** *IEEE ROBOTICS AND AUTOMATION LETTERS*

  Kennedy, M., Schmeckpeper, K., Thakur, D., Jiang, C., Kumar, V., Daniilidis, K.

  2019; 4 (3): 2317–24

- **Modeling And Control For Robotic Assistants: Single And Multi-Robot Manipulation**

  Kennedy, M. D.

  Publicly Accessible Penn Dissertations.

  2019 (3299):

- **Optimal Paths for Polygonal Robots in SE(2)**

  Kennedy, M., Thakur, D., Hsieh, M., Bhattacharya, S., Kumar, V.

  ASME.2018

- **Object Picking Through In-Hand Manipulation Using Passive End-Effectors With Zero Mobility** *IEEE ROBOTICS AND AUTOMATION LETTERS*

  Mucchiani, C., Kennedy, M., Yim, M., Seo, J.

  2018; 3 (2): 1096–1103

- **Precise dispensing of liquids using visual feedback** *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*

  Kennedy, M. D., Queen, K., Thakur, D., Daniilidis, K., Kumar, V.

  2017

- **Precise Dispensing of Liquids Using Visual Feedback**

  Kennedy, M., Queen, K., Thakur, D., Daniilidis, K., Kumar, V., Bicchi, A., Okamura, A.

  IEEE.2017: 1260–66

- **A Triangle Histogram for Object Classification by Tactile Sensing**

  Zhang, M. M., Kennedy, M. D., Hsieh, M., Daniilidis, K., IEEE

  IEEE.2016: 4931–38

- **DECENTRALIZED ALGORITHM FOR FORCE DISTRIBUTION WITH APPLICATIONS TO COOPERATIVE TRANSPORT**

  Kennedy, M. D., Guerrero, L., Kumar, V., ASME

  AMER SOC MECHANICAL ENGINEERS.2016

- **Decentralized Algorithm for Force Distribution With Applications to Cooperative Transport** *International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*

  Kennedy III , M., Guerrero, L., Kumar, V.

  2015

- **Automated biomanipulation of single cells using magnetic microrobots** *INTERNATIONAL JOURNAL OF ROBOTICS RESEARCH*

Steager, E. B., Sakar, M., Magee, C., Kennedy, M., Cowley, A., Kumar, V.

2013; 32 (3): 346–59