Mela Coffey

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Education

Boston University   Boston, MA
Ph.D., Mechanical Engineering   Expected 2025
M.S., Mechanical Engineering   2023
- Concentration: Dynamics, Systems, and Controls | GPA: 3.84/4.00

Virginia Tech   Blacksburg, VA
B.S., Engineering Science and Mechanics, *summa cum laude*   2020
- Concentration: Biomechanics | Minors: Biomedical Engineering, Mathematics | GPA: 3.80/4.00

Honors and Awards

Rising Stars in ME Workshop   2024
Carnegie Mellon University

NextProf Nexus Workshop   2024
University of Michigan

RSS Pioneers Workshop   2024
Robotics: Science and Systems (RSS)

IROS 2023 RAS Travel Grant   2023
IEEE Robotics and Automation Society (RAS)

ICRA 2023 RAS Travel Grant   2023
IEEE Robotics and Automation Society (RAS)

Grace Hopper Celebration Travel Award   2023
Boston University, Division of Systems Engineering and Center for Information and Systems Engineering (CISE)

Best Presentation Award, CISE Graduate Student Workshop (CGSW 9.0)   2023
Boston University, Center for Information and Systems Engineering (CISE)

Ford Foundation Fellowship Honorable Mention, Predoctoral Competition   2020, 2021, 2022
National Academies

Distinguished Mechanical Engineering Fellowship   2020
Boston University

Summer Undergraduate Research Fellowship   2019
Stanford University

Boeing Scholarship   2017, 2018
Virginia Tech

Research Experience

Graduate Research Assistant, Boston University   Boston, MA
Collaborative Autonomy Group, PI: Alyssa Pierson   Feb 2021 - Present
- Design adaptive control algorithms for distributed, heterogeneous multi-agent systems
- Develop a novel haptic guidance control scheme for collision-free collaborative navigation
- Hardware experiments with AgileX LIMO robots, SparkFun Jetbots, and Geomagic Touch haptic devices

Graduate Research Assistant, Boston University   Boston, MA
Collaborative and Integrative Robotics Lab, PI: Rebecca Khurshid   Aug 2020 - Feb 2021
- Developed haptic modules of various modalities for rapid prototyping of haptic displays
- Created a reusable, skin-safe silicone adhesive used to adhere modules to skin

Undergraduate Research Assistant, Virginia Tech   Blacksburg, VA
Socha Lab, PI: Jake Socha   Oct 2017 - Mar 2020
- Analyzed videos, still images, and motion-capture data for the gap-crossing of flying snakes
- Collected morphological and locomotor data of jumping snakes in Australia's Daintree Rainforest

Undergraduate Research Fellow, Stanford University   Stanford, CA
Biomimetics and Dexterous Manipulation Lab, PI: Mark Cutkosky   Jun 2019 - Aug 2019
- Designed and constructed an MRI-compatible surgical drive-by wire system for liver biopsies
- Engineered a phantom mold box for optical transparency required during data collection

Research Intern, George Mason University   Fairfax, VA
Biomedical Imaging Lab, PI: Siddhartha Sikdar   May 2018 - Jun 2019
- Prototyped and evaluated a skin stretch device for haptic feedback in prostheses
- Quantified the motion of upper-limb prostheses using inertial measurement units (IMU)

Journal Publications

[J2] **M. Coffey** and A. Pierson, "Persistent multi-resource coverage with heterogeneous multi-robot teams," *Autonomous Robots*, Submitted

[J1] S. Frishman, A. Kight, I. Pirozzi, **M. C. Coffey**., B. Daniel, and M. Cutkosky, "Enabling In-Bore MRI-Guided Biopsies with Force Feedback," *IEEE Transactions on Haptics*, vol. 13, no. 1, 2020

Peer-Reviewed Conference Publications

[C9] **M. Coffey**, A. Chaudhry[†], and A. Pierson, "Maximizing reputation for serving time-constrained tasks with distributed heterogeneous teams," in *2025 IEEE International Conference on Robotics and Automation (ICRA)*, Under Review

[C8] D. Zhang, **M. Coffey**, and R. Tron, "Learning from haptics: Tuning control barrier functions in haptic teleoperation," in *2025 IEEE International Conference on Robotics and Automation (ICRA)*, Under Review

[C7] **M. Coffey** and A. Pierson, "Assessing reputation to improve team performance in heterogeneous multi-robot coverage," in *2024 IEEE International Conference on Robotics and Automation (ICRA)*, pp. 2571–2577, 2024

[C6] K. Vakil, **M. Coffey**, and A. Pierson, "Partial belief space planning for scaling stochastic dynamic games," in *2024 IEEE International Conference on Robotics and Automation (ICRA)*, pp. 7222–7228, 2024

[C5] **M. Coffey** and A. Pierson, "Covering Dynamic Demand with Multi-Resource Heterogeneous Teams," in *2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 11127–11134, 2023

[C4] **M. Coffey**[*], D. Zhang[*], R. Tron, and A. Pierson, "Reactive and Safe Co-Navigation with Haptic Guidance," in *2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 213–220, 2023

[C3] **M. Coffey** and A. Pierson, "Heterogeneous Coverage and Multi-Resource Allocation in Supply-Constrained Teams," in *2023 IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3447–3453, 2023

[C2] **M. Coffey** and A. Pierson, "Collaborative Teleoperation with Haptic Feedback for Collision-Free Navigation of Ground Robots," in *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 8141–8148, 2022

[C1] R. Cruz[*], **M. C. Coffey**[*], A. Sawaya, and R. Khurshid, "Modular Haptic Feedback for Rapid Prototyping of Tactile Displays," in *2021 IEEE World Haptics Conference, WHC 2021*, 2021

Workshops and Poster Sessions

- **M. Coffey**, A. P. Chaudhry, and A. Pierson, "Maximizing Reputation for Serving Time-Constrained Tasks with Distributed Heterogeneous Teams," *Northeast Robotics Colloquium (NERC) 2024*, Sep 28, 2024, Amherst, MA, USA.
- **M. Coffey** and A. Pierson, "Assessing Reputation to Improve Team Performance in Heterogeneous Multi-Robot Coverage," *CISE Graduate Student Workshop 2024 (CGSW 10.0)*, Jan 26, 2024, Boston University.
- **M. Coffey** and A. Pierson, "Heterogeneous Coverage and Multi-Resource Allocation in Supply-Constrained Teams," *CISE Graduate Student Workshop 2023 (CGSW 9.0)*, Jan 27, 2023, Boston University. **Awarded Best Presentation**.
- **M. Coffey** and A. Pierson, "Heterogeneous Coverage and Multi-Resource Allocation in Supply-Constrained Teams," poster session in *The 16th International Symposium on Distributed Autonomous Robotic Systems (DARS) 2022*, Nov 28-30, 2022, Montbèliard, France.
- **M. Coffey** and A. Pierson, "Collaborative Teleoperation with Haptic Feedback for Collision-Free Navigation of Ground Robots," poster session in *Northeast Robotics Colloquium (NERC) 2022*, Oct 8, 2022, Lowell, MA, USA.
- C. Meduri, A. Simon, L. De Koninck, **M. Coffey**, E. Claros, M. Velazquez, P. G. Brolinson, B. McCrady, E. Vlaisavljevich, V. Wang, "Design of a Focused Ultrasound System for the Non-invasive Treatment of Injured Tendons," poster in *BMES 2020 Virtual Annual Meeting*, Oct 14-17, 2020.
- **M. Coffey**, S. Frishman, M. Cutkosky, "Teleoperator for MRI-Guided Procedures," poster session in *Summer Undergraduate Research Fellowship*, Aug 15, 2019, Stanford, CA, USA.
- **M. Coffey**, B. Mukherjee, A. Dhawan, S. Patwardhan, S. Sikdar, "Evaluation of a Skin Stretch Device for Haptic Feedback in Prosthetic Limbs," poster session in *Aspiring Scientists Summer Internship Program*, Aug 10, 2018, Fairfax, VA, USA.

Patent Applications

[P1] US Provisional Patent Application No 63/651,894, "Methods and Systems for Automated and Requirements-Driven Prompt Engineering and Tuning of a Large Language Model"

[*]Co-first author
[†]Mentored student

Professional Activities

Teaching Roles

Graduate Teaching Assistant, Engineering Mechanics II   Jan 2022 - May 2022
Boston University, Course No. ENG ME 302

- Prepared practice problems for and led the two weekly discussion sessions
- Constructed quiz and exam problems
- Graded homeworks and quizzes
- Received an overall student rating of 4.83/5

Graduate Teaching Assistant, Intro to Programming for Engineers   Aug 2021 - Dec 2021
Boston University, Course No. ENG EK 125

- Led weekly discussion sessions to review material and answer any questions
- Assisted in lecture and lab sections to answer students' questions as they work through programming problems
- Graded homeworks, projects, and quizzes
- Received an overall student rating of 4.27/5

Professional Service

Committee on Inclusion & Diversity, Graduate Student Member   Dec 2021 - Present
College of Engineering, Boston University

Volunteer STEM Instructor   Aug 2020 - May 2021
Graduate Women In Science and Engineering (GWISE), Boston University

Professional Honors

Rising Stars in ME Workshop   2024
Carnegie Mellon University

NextProf Nexus Workshop   Aug 26-29, 2024
University of Michigan

RSS Pioneers Workshop   Jul 14-19, 2024
Robotics: Science and Systems (RSS), Delft Netherlands

NextProf Pathfinder Workshop   Oct 17-19, 2021
University of Michigan

Voices from the Field Panelist   Oct 16, 2021
National GEM Consortium

Leadership Roles

Co-founder and Peer Mentor   Boston, MA
HUGE PhD Success, Boston University   Jun 2021 - May 2022

- Worked with the BU College of Engineering Office of Inclusion and Outreach to develop the Historically Underrepresented Groups in Engineering (HUGE) PhD Success
- Mentored a first-year PhD student in mechanical engineering to help them navigate their first year of graduate school
- Recruited participants, mentors, and mentees to the program
- Helped plan events and gatherings for the semester

Peer Leader   Blacksburg, VA
Center for the Enhancement of Engineering Diversity, Virginia Tech   Nov 2017 - May 2020

- Coordinated events focused on aiding freshman engineering students' transition to college
- Interviewed, selected, and trained new and returning mentors
- Managed a group of 12-13 upper-class mentors
- Recruited mentors and mentees through presentations and booths at events such as open house

Professional Memberships

IEEE Robotics and Automation Technical Committee on Multi-Robot Systems (MRS TC) · IEEE Robotics & Automation Society (RAS) · Women in Robotics · IEEE Student Member · IEEE Women in Engineering · IEEE Young Professionals

Reviewer for

IEEE Transactions on Robotics (T-RO) · IEEE Robotics and Automation Letters (RA-L) · IEEE International Conference on Robotics and Automation (ICRA) · IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

Mentoring

Undergraduates at BU: Arnav Chaudhry, Jared Pratt, Kyle Karr, Berkely Wachtmann, Arnab Vijayakar

Additional Work and Project Experience

Co-Founder, Chief Science Officer   Boston, MA

Sharp Selections, Inc.   Mar 2024 - Present

- Developed an algorithm for requirement-driven automated prompt engineering and tuning for questions with unknown answers; associated with Patent [P1]
- Manage company budget and spending

Product Design Engineer Intern   Seattle, WA

Amazon   June 2021 - Aug 2021

- Designed mechanical parts of entry/exit hardware to be deployed in Amazon Go stores in the U.S. and U.K.
- Programmed and tested alternative sensing technology for exit hardware
- Communicated with vendors about product specifications and manufacturing

Design of a Focused Ultrasound Device for Tendon Regeneration   Blacksburg, VA

Virginia Tech, Senior Design   Aug 2019 - May 2020

Orthopedic Mechanobiology Lab, PI: Vincent Wang

Therapeutic Ultrasound and Noninvasive Therapies Lab, PI: Eli Vlaisavljevich

- Constructed electronic components of devices such as the ultrasonic transducer elements and power amplifier
- Team lead; ran meetings, ensured each member was making active contributions, and communicated with advisors
- Managed project budget and ordering of materials

Skills

Programming Languages	Python (fluent), MATLAB (fluent), C/C++ (proficient)
Software	ROS, SolidWorks, Creo, OnShape, Autodesk Inventor, LaTex
Lab Techniques	3D printing, laser cutting, soldering
Lab Equipment	Motion capture, band saw, cold saw, miter saw, drill press