

Connor M. McCann

SOFT ROBOTICS • WEARABLE ROBOTICS • ROBOTIC GRASPING
MECHANISM DESIGN • NUMERICAL MODELING

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EDUCATION

Harvard University	Cambridge, MA
PH.D. IN MECHANICAL ENGINEERING	2024 (expected)
<ul style="list-style-type: none">Research Advisors: Profs. Conor J. Walsh & Katia BertoldiNSF Graduate Research Fellow	
M.S. IN MECHANICAL ENGINEERING	2021
Yale University	New Haven, CT
B.S. IN MECHANICAL ENGINEERING	2018
<ul style="list-style-type: none">Research Advisor: Prof. Aaron M. Dollar	

HONORS & AWARDS

2023	Certificate of Distinction in Teaching	Harvard Derek Bok Center for Teaching & Learning
2021	Certificate of Distinction in Teaching	Harvard Derek Bok Center for Teaching & Learning
2018	NSF Graduate Research Fellowship	National Science Foundation
2018	Donald Warren McCrosky Prize	Yale School of Engineering & Applied Science
2017	Belle & Carl Morse Junior Scholarship	Yale School of Engineering & Applied Science
2017	Student Mechanism & Robot Design Competition, 2nd Place	ASME IDETC Conference
2017	Student Design Showcase, 3rd Place	Design of Medical Devices Conference

RESEARCH EXPERIENCE

Harvard University: Biodesign Lab & Bertoldi Group	Cambridge, MA
STUDENT RESEARCHER (ADVISORS: PROFS. CONOR J. WALSH & KATIA BERTOLDI)	2018 – present
<ul style="list-style-type: none">Developing techniques for the characterization, modeling, and optimization of wearable soft robots in the presence of complex human body interactions.Specifically focusing on pneumatic soft actuators made from woven textiles for shoulder joint assistance.	
Yale University: GRAB Lab	New Haven, CT
STUDENT RESEARCHER (ADVISOR: PROF. AARON M. DOLLAR)	2015 – 2018
<ul style="list-style-type: none">Developed a Stewart-Gough platform-based robotic hand for dexterous 6-DOF, in-hand manipulation.Created a reconfigurable truss system for rapid assembly of lightweight, high-rigidity structures.	
Massachusetts Institute of Technology: Robot Locomotion Group	Cambridge, MA
RESEARCH INTERN (ADVISOR: PROF. RUSS L. TEDRAKE)	2014
<ul style="list-style-type: none">Developed a computational model of a robotic bird for motion planning.	
Harvard Medical School: Surgical Navigation & Robotics Lab	Boston, MA
RESEARCH INTERN (ADVISOR: PROF. NOBUHIKO HATA)	2013
<ul style="list-style-type: none">Created a device to measure biopsy needle insertion depth during robotic, MRI-guided surgeries.	

INDUSTRY EXPERIENCE

Toyota Research Institute

Cambridge, MA

RESEARCH INTERN (ADVISOR: MIT PROF. RUSS L. TEDRAKE)

2017

- Developed soft robotic tactile sensors for in-home robotic manipulation tasks.
- Gained experience fabricating various types of soft robotic sensing skins.

Ekso Bionics

Richmond, CA

MECHANICAL ENGINEERING INTERN

2016

- Worked with engineering team to develop exoskeletons for medical and industrial applications.
- Designed and built an original cycle-testing apparatus for the company's *zeroG Arm* system to cycle that device through its full range of motion and simulate real world loading.

PUBLICATIONS & TALKS

(* Indicates these authors contributed equally to this work.)

Refereed Journal Articles

- [J5] **C. M. McCann**, C. J. Hohimer, C. T. O'Neill, H. T. Young, K. Bertoldi, and C. J. Walsh, "In-Situ Measurement of Multi-Axis Torques Applied by Wearable Soft Robots for Shoulder Assistance," *IEEE Transactions on Medical Robotics and Bionics (T-MRB)*, vol. 5, no. 2, 2023.
- [J4] E. Gallardo Hevia, **C. M. McCann**, M. Bell, N. Hyun, C. Majidi, K. Bertoldi, and R. J. Wood, "High-Gain Microfluidic Amplifiers: The Bridge between Microfluidic Controllers and Fluidic Soft Actuators," *Advanced Intelligent Systems (AIS)*, no. 2200122, 2022.
- [J3] C. T. O'Neill, **C. M. McCann**, C. J. Hohimer, K. Bertoldi, and C. J. Walsh, "Unfolding Textile-Based Pneumatic Actuators for Wearable Applications," *Soft Robotics (SoRo)*, vol. 9, no. 1, 2021.
- [J2] **C. M. McCann***, V. V. Patel*, and A. M. Dollar, "The Stewart Hand: A Highly Dexterous, Six-Degrees-of-Freedom Manipulator Based on the Stewart-Gough Platform," *IEEE Robotics and Automation Magazine (RAM)*, vol. 28, no. 2, 2021.
- [J1] Z. Xu, **C. M. McCann**, and A. M. Dollar, "Reconfigurable Modular Chain: A Reversible Material for Folding Three-Dimensional Lattice Structures," *ASME Journal of Mechanisms and Robotics (JMR)*, vol. 9, no. 2, 2017.

Refereed Conference Papers

- [C4] Y. Jin*, Y. M. Zhou*, **C. M. McCann**, T. Proietti, C. H. Rycroft, and C. J. Walsh, "A Data-based Approach to Simultaneously Align Local and Global Frames between an Inertial Measurement Unit (IMU) and an Optical Motion Capture System," in *Proceedings of the IEEE International Conference on Biomedical Robotics & Biomechatronics (BioRob)*, 2022.
- [C3] **C. M. McCann** and A. M. Dollar, "Analysis and Dimensional Synthesis of a Robotic Hand Based on the Stewart-Gough Platform," in *Proceedings of the ASME International Design Engineering and Technical Conferences (IDETC)*, 2018.
- [C2] **C. M. McCann** and A. M. Dollar, "Design of a Stewart Platform-Inspired Dexterous Hand for 6-DOF Within-Hand Manipulation," in *Proceedings of the IEEE International Conference on Intelligent Robots and Systems (IROS)*, 2017.
- [C1] Z. Xu, **C. M. McCann**, and A. M. Dollar, "Design of a Reconfigurable Modular Chain for Folding 3D Lattice Structures," in *Proceedings of the ASME International Design Engineering and Technical Conferences (IDETC)*, 2016.

Patents and Applications

- [P1] C. J. Walsh, J. M. Arnold, C. Lehmacher, and **C. M. McCann**, "System and Method for Controlling a Wearable Robotic Device," U.S. Provisional Patent Application 63/581,575, Sep. 8, 2023.

Invited Talks

- [I1] **C. M. McCann**, "Textile soft robots for the upper extremity: actuation, materials, and evaluation," at *Georgia Institute of Technology ExoSkin Symposium*, 2024.

Contributed Talks and Posters

- [T14] **C. M. McCann**, J. Arnold, C. Lehmacher, K. Bertoldi, and C. J. Walsh, “Hysteresis as a Feature, not a Bug—Exploiting Textile Hysteresis for Wearable Soft Robots,” at *American Physical Society (APS) March Meeting*, 2024.
- [T13] **C. M. McCann**, J. Arnold, C. Lehmacher, K. Bertoldi, and C. J. Walsh, “Hysteresis Modeling for Woven Textile Soft Actuators,” at *Northeast Robotics Colloquium (NERC)*, 2023.
- [T12] **C. M. McCann**, J. Arnold, C. Lehmacher, K. Bertoldi, and C. J. Walsh, “Hysteresis Modeling for Woven Textile Soft Actuators,” at *Society of Engineering Sciences (SES)*, 2023.
- [T11] D. Farrell, **C. M. McCann**, A. Delpy, A. E. Forte, R. Sourki, C. J. Walsh, and K. Bertoldi, “Textile metamaterials for Wearable Robotics,” at *Society of Engineering Sciences (SES)*, 2023.
- [T10] D. Farrell, **C. M. McCann**, A. E. Forte, R. Sourki, C. J. Walsh, and K. Bertoldi, “Force Manipulation Across a Textile Metamaterial,” at *American Physical Society (APS) March Meeting*, 2023.
- [T9] C. Bösch, G. Bordiga, **C. M. McCann**, E. Medina, M. Yuen, Y. Jin, O. Araromi, A. Fichtner, and K. Bertoldi, “Autonomous Control of a Mobile Robot using a Mechanical Metamaterial “Brain”,” at *American Physical Society (APS) March Meeting*, 2023.
- [T8] **C. M. McCann**, C. J. Hohimer, C. T. O’Neill, H. T. Young, K. Bertoldi, and C. J. Walsh, “In-Situ Measurement of Multi-Axis Torques Applied by Wearable Soft Robots for Shoulder Assistance,” at *Northeast Robotics Colloquium (NERC)*, 2022.
- [T7] Y. M. Zhou, C. J. Hohimer, H. T. Young, **C. M. McCann**, H. Cho, Y. Jin, P. Banzet, P. Murphy, D. Wagner, T. Cole, T. Proietti, and C. J. Walsh, “A Portable Inflatable Soft Wearable Robot for Supporting the Shoulder during Industrial Overhead Tasks,” at *Northeast Robotics Colloquium (NERC)*, 2022.
- [T6] Y. Jin, Y. M. Zhou, **C. M. McCann**, T. Proietti, C. H. Rycroft, and C. J. Walsh, “Visualizing IMU Drift During Shoulder Kinematics Tracking,” at *Northeast Robotics Colloquium (NERC)*, 2022.
- [T5] **C. M. McCann**, C. J. Hohimer, C. T. O’Neill, H. T. Young, K. Bertoldi, and C. J. Walsh, “In-Situ Measurement of Multi-Axis Torques Applied by Wearable Soft Robots for Shoulder Assistance,” at *Gordon Research Conference & Seminar (GRC/GRS)*, 2022.
- [T4] **C. M. McCann**, C. J. Hohimer, C. T. O’Neill, H. T. Young, K. Bertoldi, and C. J. Walsh, “In-Situ Measurement of Multi-Axis Torques Applied by Wearable Soft Robots for Shoulder Assistance,” at *Workshop on Determining Appropriate Metrics and Test Methods for Soft Actuators in Robotic Systems at IEEE International Conference on Robotics and Automation (ICRA)*, 2022.
- [T3] D. Farrell, **C. M. McCann**, A. E. Forte, R. Sourki, C. Walsh, and K. Bertoldi, “Wearable Mechanical Textile Metamaterials,” at *American Physical Society (APS) March Meeting*, 2022.
- [T2] A. M. West, H. Mandl, **C. M. McCann**, N. Gunawardena, A. Morris, A. Siefert, and J. Zinter, “A Novel Sternotomy Saw Guide Incorporating Integrated Rigid Fixation,” at *Design of Medical Devices (DMD) Conference*, 2017.
- [T1] K. Palmer, D. Alelyunas, **C. M. McCann**, K. Yoshimitsu, T. Kato, S.-E. Song, and N. Hata, “Development and evaluation of optical needle depth sensor for percutaneous diagnosis and therapies,” at *SPIE Medical Imaging*, vol. 9036, 2014.

TEACHING EXPERIENCE

Harvard University

Cambridge, MA
Fall 2022

TEACHING FELLOW (ES 242R)

- Graduate course on nonlinear finite element method
- Developed new course material with instructor (Prof. Katia Bertoldi), including implementing nonlinear finite-element solver in Matlab

TEACHING FELLOW (ES 128/228)

Spring 2020 & Fall 2020

- Joint undergraduate/graduate course on finite-element method
- Developed Matlab programming assignments to implement linear FEM solver

PEER REVIEW

- Nature
- IEEE Robotics and Automation Letters (RA-L)
- IEEE Robotics and Automation Magazine (RA-M)
- IEEE International Conference on Robotics and Automation (ICRA)
- Mechatronics
- Applied Physics Reviews (APR)
- Extreme Mechanics Letters (EML)
- Soft Robotics (SoRo)

OUTREACH

EXPLO Program

Wellesley, MA

GUEST LECTURER

2022

- Invited to present my research from Harvard University to high school students during a summer course on origami robotics.
- Taught two lectures and served as a guest panelist for the students' final projects.

SPLASH Program

New Haven, CT

STUDENT INSTRUCTOR

2016 – 2018

- Taught stand-alone lectures to high school students on robotic mechanism design and kinematics, including live robotic demos from my research at Yale University.

STUDENT SUPERVISION

Lana Wagner	Harvard University	(bachelor's student)
Christian Mitsch	ETH Zurich	(visiting master's student)
Reza Sourki	University of British Columbia	(visiting doctoral student)
Joseph Sanchez	Harvard University	(bachelor's student)
Harrison Young	Olin College	(visiting bachelor's student)