

G.G. Brown Building, Office 3480
2350 Hayward St, Ann Arbor, MI 48109

bruderd@umich.edu
www.danielbruder.com

Education

University of Michigan
Ph.D., Mechanical Engineering, 2020
M.S., Mechanical Engineering, 2020
Fields: Robotics and Control

Harvard University
B.S., Engineering Sciences, 2013
Honors: Magna Cum Laude

Research

Mechanical Engineering Dept, University of Michigan-Ann Arbor
Assistant Professor, 2023-present

School of Engineering and Applied Sciences, Harvard University
Postdoctoral Fellow, 2020-2023

Mechanical Engineering Dept, University of Michigan-Ann Arbor
Graduate Student Researcher, 2015-2020
Dissertation: Towards a Universal Modeling and Control Framework for Soft Robots

School of Engineering and Applied Sciences, Harvard University
Undergraduate Student Researcher, 2011
Project: Design of mitral valve repair surgical device

Teaching

Mechanical Engineering Dept, University of Michigan
Graduate Student Instructor, Robot Kinematics and Dynamics, 2017
Graduate Student Instructor, Designs in Nature and Engineering, 2016

Jalen Rose Leadership Academy, Promise Schools Detroit
Full-time Mathematics Teacher, Algebra and Geometry, 2013-2015

School of Engineering and Applied Sciences, Harvard University
Design Specialist, Capstone Design Course, 2012-2013

Physics Dept, Harvard University
Teaching Assistant, Lab Electronics: Analog and Digital Circuit Design, 2011

Mathematics Dept, Harvard University
Course Assistant, Calculus, Series, and Differential Equations, 2009-2010
Course Assistant, Functions and Calculus, 2009

Awards and Fellowships

NSF Graduate Research Fellowship
National Science Foundation, 2017-2020

Richard and Eleanor Towner Prize for Outstanding Ph.D. Research
University of Michigan, 2019

NextProf Nexus Travel Grant
Georgia Institute of Technology, 2019

Best Systems Paper Finalist, Best Student Paper Finalist
Robotics: Science and Systems Conference, 2019

RSS Pioneers Travel Grant
Robotics: Science and Systems Conference, 2019

Honorable Mention, Ford Foundation Fellowship
National Academies of Sciences, Engineering, and Medicine, 2017

Publications Journal Papers

- [J1] D. Bruder and R. Wood. The chain-link actuator: Exploiting the bending stiffness of mck-ibben artificial muscles to achieve larger contraction ratios. *IEEE Robotics and Automation Letters*, 2021
- [J2] D. Bruder, X. Fu, R. B. Gillespie, C. D. Remy, and R. Vasudevan. Koopman-based control of a soft continuum manipulator under variable loading conditions. *IEEE Robotics and Automation Letters*, 6(4):6852–6859, 2021
- [J3] D. Bruder, X. Fu, and R. Vasudevan. Advantages of bilinear koopman realizations for the modeling and control of systems with unknown dynamics. *IEEE Robotics and Automation Letters*, 6(3):4369–4376, 2021. doi: 10.1109/LRA.2021.3068117
- [J4] D. Bruder, X. Fu, R. B. Gillespie, C. D. Remy, and R. Vasudevan. Data-driven control of soft robots using koopman operator theory. *IEEE Transactions on Robotics*, pages 1–14, 2020. doi: 10.1109/TRO.2020.3038693
- [J5] D. Bruder, A. Sedal, R. Vasudevan, and C. D. Remy. Force generation by parallel combinations of fiber-reinforced fluid-driven actuators. *IEEE Robotics and Automation Letters*, 3(4):3999–4006, Oct 2018. ISSN 2377-3766. doi: 10.1109/LRA.2018.2859441
- [J6] A. Sedal, D. Bruder, J. Bishop-Moser, R. Vasudevan, and S. Kota. A continuum model for fiber-reinforced soft robot actuators. *Journal of Mechanisms and Robotics*, 10(2):024501, 2018

Conference Papers

- [C1] S. M. Danforth, M. Kohler, D. Bruder, A. R. D. Rabosky, S. Kota, R. Vasudevan, and T. Y. Moore. Emulating duration and curvature of coral snake anti-predator thrashing behaviors using a soft-robotic platform. In *2020 IEEE International Conference on Robotics and Automation (ICRA)*, pages 5068–5074. IEEE, 2020
- [C2] D. Bruder, B. Gillespie, C. D. Remy, and R. Vasudevan. Modeling and control of soft robots using the koopman operator and model predictive control. In *Proceedings of Robotics: Science and Systems*, FreiburgimBreisgau, Germany, June 2019a. doi: 10.15607/RSS.2019.XV.060

- [C3] D. Bruder, C. D. Remy, and R. Vasudevan. Nonlinear system identification of soft robot dynamics using koopman operator theory. In *Robotics and Automation (ICRA), 2019 IEEE International Conference on*. IEEE, 2019b
- [C4] D. Bruder, A. Sedal, J. Bishop-Moser, S. Kota, and R. Vasudevan. Model based control of fiber reinforced elastofluidic enclosures. In *Robotics and Automation (ICRA), 2017 IEEE International Conference on*, pages 5539–5544. IEEE, 2017
- [C5] A. Sedal, D. Bruder, J. Bishop-Moser, R. Vasudevan, and S. Kota. A constitutive model for torsional loads on fluid-driven soft robots. In *ASME 2017 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, pages V05AT08A016–V05AT08A016. American Society of Mechanical Engineers, 2017

Workshop and Meeting Presentations

- [P1] D. Bruder. Making Soft Robotics Less Hard: Towards a Unified Modeling, Design, and Control Framework. *AI in Robotics Seminar, University of Toronto*. 2022
- [P2] D. Bruder. Making Soft Robotics Less Hard: Towards a Unified Modeling, Design, and Control Framework. *Cornell Robotics Seminar, Cornell University*. 2022
- [P3] D. Bruder. Making Soft Robotics Less Hard: Towards a Unified Modeling, Design, and Control Framework. *Prof. Shankar Sastry's Semiautonomous Seminar, University of California, Berkeley*. 2022
- [P4] D. Bruder. Towards a Universal Modeling and Control Framework for Soft Robots. *Illinois Robotics Seminar, University of Illinois at Urbana-Champaign*. 2021
- [P5] D. Bruder. Leveraging Data and the Koopman Operator to Build Control-oriented Models of Soft Robots. *Modeling Soft Robots: A Discussion on Capabilities and Limitations of Numerous Techniques*. 2020
- [P6] D. Bruder. Modeling and Control of Soft Robots Using the Koopman Operator. *Engineering Research Symposium, University of Michigan*. 2019
- [P7] D. Bruder, R. Vasudevan. Leveraging Data to Model and Control Soft Robots. *Robotics: Science and Systems Pioneers*. 2019
- [P8] T. Y. Moore, D. Bruder, A. Davis Rabosky, R. Vasudevan. Decoupling Coupled Anti-Predator Signals with a Bio-Inspired Snake Robot. *Society for Integrative and Comparative Biology Annual Meeting*. 2019
- [P9] D. Bruder, A. Sedal, R. Vasudevan, and C. D. Remy. Model-Based Method for Estimating the Workspace of Soft Manipulators. *Workshop on Soft Robot Modeling and Control at IROS*. 2018
- [P10] D. Bruder, A. Sedal, R. Vasudevan, and C. D. Remy. Model-Based Control of Parallel Combinations of Soft Actuators. *Midwest Robotics Workshop (poster)*. 2018
- [P11] R. B. Gillespie, C. D. Remy, D. Bruder, A. Sedal. Don't Bite the Hand that Feeds You: Soft Robots For Eldercare. *Toyota Research Institute Annual Meeting*. 2018
- [P12] D. Bruder, A. Sedal, J. Bishop-Moser, S. Kota, and R. Vasudevan. Model Based Control of Fiber Reinforced Elastofluidic Enclosures. *Midwest Robotics Workshop (poster)*. 2017
- [P13] D. Bruder, R. Vasudevan, C.D. Remy. Design and Modeling of Soft Robotic Arm Modules. *Toyota Research Institute Annual Meeting (poster)*. 2017

Service & Outreach	<p>Reviewer T-RO, RA-L, T-MECH, ICRA, IROS, RoboSoft, Soft Robotics, Mechatronics, Automatica</p> <p>REACT Workshop for K-12 Educators Robotics Track Lead, 2020 Robotics Activity Coordinator, 2019</p> <p>RSS Pioneers Program Committee Member, 2020</p> <p>FIRST Robotics Competition Mentor, 2015-2018</p>
Press	<p>How To Do Grad School (podcast) Daniel Bruder - Teaching, Collaborations, & Getting Started in Research, Sept. 24, 2020</p> <p>The Michigan Engineer News Center Grad student's ventilator design sparks conversations with doctors and engineers, Apr. 17, 2020</p>
Languages and Skills	<p>English (native), Spanish (basic) Matlab, \LaTeX, Solidworks, Python, HTML</p>