

Harvard University
School of Engineering and Applied Sciences
89 Winthrop Mail Ctr, Cambridge, MA 02138

dbruder@seas.harvard.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**
- School of Engineering and Applied Sciences, Harvard University**
Postdoctoral Researcher, 2020-present
- Mechanical Engineering Dept, University of Michigan**
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. Towards a Universal Modeling and Control Framework for Soft Robots. *Illinois Robotics Seminar, University of Illinois at Urbana-Champaign*. 2021

- [P2] 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
- [P3] D. Bruder. Modeling and Control of Soft Robots Using the Koopman Operator. *Engineering Research Symposium, University of Michigan*. 2019
- [P4] D. Bruder, R. Vasudevan. Leveraging Data to Model and Control Soft Robots. *Robotics: Science and Systems Pioneers*. 2019
- [P5] 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
- [P6] 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
- [P7] D. Bruder, A. Sedal, R. Vasudevan, and C. D. Remy. Model-Based Control of Parallel Combinations of Soft Actuators. *Midwest Robotics Workshop (poster)*. 2018
- [P8] 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
- [P9] 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
- [P10] D. Bruder, R. Vasudevan, C.D. Remy. Design and Modeling of Soft Robotic Arm Modules. *Toyota Research Institute Annual Meeting (poster)*. 2017

Service & Outreach

Reviewer

T-RO, RA-L, T-MECH, ICRA, IROS, RoboSoft, Soft Robotics, Mechatronics, Automatica

REACT Workshop for K-12 Educators

Robotics Track Lead, 2020

Robotics Activity Coordinator, 2019

RSS Pioneers

Program Committee Member, 2020

FIRST Robotics Competition

Mentor, 2015-2018

Press

How To Do Grad School (podcast)

[Daniel Bruder - Teaching, Collaborations, & Getting Started in Research](#), Sept. 24, 2020

The Michigan Engineer News Center

[Grad student's ventilator design sparks conversations with doctors and engineers](#), Apr. 17, 2020

Languages and Skills

English (native), Spanish (basic)

Matlab, \LaTeX , Solidworks, Python, HTML