

Nima Fazeli

Assistant Professor of Robotics

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Professional Appointments

University of Michigan:

- 2022 – Present Assistant Professor, Department of Robotics
- 2024 – Present Affiliate Faculty of Computer Science and Engineering, EECS
- 2022 – Present Affiliate Faculty of Mechanical Engineering
- 2020 – 2022 Assistant Professor, Department of Mechanical Engineering

Education

- 2020 Postdoc, MIT (Advised by Prof. Alberto Rodriguez)
- 2019 PhD, MIT Mechanical Engineering (Advised by Prof. Alberto Rodriguez)
- 2014 MSc, UMD Mechanical Engineering (Advised by Prof. Jin-Oh Hahn)
- 2012 MSc, University of Alberta, Transferred to UMD to complete MSc
- 2011 BSc, Amirkabir University of Technology, Mechanical Engineering

Awards and Honors

Academic Awards:

- 2024 NSF CAREER Award
- 2022 Agilent Early Career Professor Award Finalist
- 2022 Amazon Research Award – Robotics
- 2021 Google Faculty Research Award
- 2014 Rohsenow Fellowship – MIT
- 2013 Academic Excellence Award – UMD

Paper Awards:

- 2023 RSS Best Student Paper Finalist
Awarded to “MultiScope: Disambiguating In-Hand Object Poses ...”
- 2018 IROS Best Cognitive Robotics Paper
Awarded to “Augmenting Physical Simulators with Stochastic Neural ...”
- 2017 Best Systems Paper (Manipulation) Amazon Robotics Awards
Awarded to “Robotic Pick-and-Place of Novel Objects in Clutter ...”
- 2017 ISRR 2017 Doctoral Consortium Grant
Awarded to “Fundamental Limitations in Performance ...”
- 2016 Best Student Paper Finalist – IROS (Top 5 of 800)
Awarded to “More Than a Million Ways to be Pushed ...”
- 2015 ISRR 2015 Paper Selected for Special Issue of IJRR
Awarded to “Identifiability Analysis of Planar Rigid-Body Frictional Contact”
- 2012 Best Student Paper Finalist – 5th ASME DSCC (Top 5 of 52 nominated)
Awarded to “Active Non-Intrusive System Identification for Cardiovascular ...”

Competitions and Travel Awards:

- 2017 Sontheimer Travel Award – MIT Mechanical Engineering
- 2017 1st Place – Amazon Robotics Challenge Stowing Task
- 2016 3rd and 4th Place – Amazon Picking Challenge
- 2015 2nd Place – Amazon Picking Challenge
- 2012 Dynamic Systems and Controls Conference (DSCC) Travel Grant Award

Leadership and Service Activities

University of Michigan:

- 2022 – Present Robotics Department Seminar Committee Chair
- 2020 – Present Robotics Department Graduate Committee
- 2024 – present Robotics Diversity, Equity, and Inclusivity (DEI) Committee Member
- 2021 – 2022 Robotics Diversity, Equity, and Inclusivity (DEI) Committee Chair

2020 – 2024 Mechanical Engineering Seminar Series Committee

Robotics Community:

2023 & 2024 Area Chair – RSS
2023 Associate Editor – IJRR
2022 & 2024 Associate Editor – ICRA
2022 – Present Orbital Reef Advisory Council
2020 RSS Workshop Organizer - “Good Citizens of Robotics”
2020 Program Committee - Conference on Robot Learning (CoRL)
2020 Associate Editor IROS
2016 & 2017 Organizing Committee of Robocon at MIT
2015 Assistant Organizer of the NSF National Robotics Initiative PI Meeting
2013 Co-chair of Sys. ID. and Therapeutic Control in Bio-Systems Session DSCC

Outreach:

2023 First Robotics Manipulation and Tactile Sensing Visit and Games
2021 UM - LSAMP Robotics Summer Camp
2021 Moorehouse College Mentorship
2015 – 2016 President of the Persian Student Association at MIT
2015 – 2016 Orientation Chair for Graduate Association of Mechanical Engineers at MIT

Review Service Awards:

2016 Elsevier Recognition Certificate: Computers in Biology and Medicine
2015 Elsevier Recognition Certificate: Biomedical Signal Processing and Control

Courses Teaching

University of Michigan – Lead Instructor:

2022 Annually ROB 498 - Robot Learning for Planning and Controls
2020 Annually ROB 498 - Introduction to Robotic Manipulation
2021/2022 MECHENG 360 - Modeling, Analysis, and Control of Dynamical Systems

Publications

Under Submission:

- U1 B. Wang, N. Sridhar, C. Feng, M. Van der Merwe, A. Fishman, N. Fazeli, and J. J. Park, “This&that: Language-gesture controlled video generation for robot planning,” *IEEE International Conference on Robotics and Automation (ICRA)*, 2024
- U2 S. Rodriguez, Y. Dou, M. Oller, A. Owens, N. Fazeli, and J. J. Park, “Touch2touch: Cross-modal tactile generation for object manipulation,” *IEEE International Conference on Robotics and Automation (ICRA)*, 2024
- U3 S. Rodriguez, Y. Dou, W. van den Bogert, M. Oller, K. So, A. Owens, and N. Fazeli, “Contrastive touch-to-touch pretraining,” *IEEE International Conference on Robotics and Automation (ICRA)*, 2024
- U4 W. van den Bogert, M. Iyengar, and N. Fazeli, “Built different: Tactile perception to overcome cross-embodiment capability differences in collaborative manipulation,” *IEEE International Conference on Robotics and Automation (ICRA)*, 2024
- U5 Y. Dai, J. Lee, N. Fazeli, and J. Chai, “Racer: Rich language-guided failure recovery policies for imitation learning,” *IEEE International Conference on Robotics and Automation (ICRA)*, 2024
- U6 A. Sipos, W. van den Bogert, and N. Fazeli, “Gelslim 4.0: Focusing on touch and reproducibility,” *IEEE International Conference on Robotics and Automation (ICRA)*, 2024
- U7 S. Li, S. Rodriguez, Y. Dou, A. Owens, and N. Fazeli, “Tactile functasets: Neural implicit representations of tactile datasets,” *IEEE International Conference on Robotics and Automation (ICRA)*, 2024

- U8 X. Yi, J. Lee, and N. Fazeli, “Visual-auditory extrinsic contact estimation,” *IEEE International Conference on Robotics and Automation (ICRA)*, 2024
- U9 A. Dang, J. Lorenz, X. Yi, and N. Fazeli, “Bimanual in-hand manipulation using dual limit surfaces,” *IEEE International Conference on Robotics and Automation (ICRA)*, 2024
- U10 J. A. Eyzaguirre, M. Oller, and N. Fazeli, “Tactile neural de-rendering,” *IEEE International Conference on Robotics and Automation (ICRA)*, 2024
- U11 S. Zhong, N. Fazeli, and D. Berenson, “Rumi: Rummaging using mutual information,” *IEEE Robotics and Automation Letters (RA-L)*, 2024

Refereed Conference Proceedings:

- C1 Y. Wi, J. Lee, and N. Fazeli, “Neural inverse source problems,” *8th Conference on Robot Learning*, 2024
- C2 M. Oller, D. Berenson, and N. Fazeli, “Tactile-driven non-prehensile object manipulation via extrinsic contact mode control,” *Robotic Sciences and Systems (RSS)*, 2024
- C3 M. Oller, D. Berenson, and N. Fazeli, “Tactilevad: Geometric aliasing-aware dynamics for high-resolution tactile control,” in *7th Annual Conference on Robot Learning*, 2023
- C4 Y. Wi, M. Van der Merwe, P. Florence, A. Zeng, and N. Fazeli, “Calamari: Contact-aware and language conditioned spatial action mapping for contact-rich manipulation,” in *7th Annual Conference on Robot Learning*, 2023
- C5 X. Yi and N. Fazeli, “Precise object sliding with top contact via asymmetric dual limit surfaces,” *Robotic Sciences and Systems (RSS)*, 2023
- C6 M. Van der Merwe, Y. Wi, D. Berenson, and N. Fazeli, “Integrated object deformation and contact patch estimation from visuo-tactile feedback,” *Robotic Sciences and Systems (RSS)*, 2023
- C7 A. Sipos and N. Fazeli, “Multiscope: Disambiguating in-hand object poses with proprioception and tactile feedback,” *Robotic Sciences and Systems (RSS)*, 2023, **Best Student Paper Finalist**
- C8 S. Zhong, N. Fazeli, and D. Berenson, “Chsel: Producing diverse plausible pose estimates from contact and free space data,” *Robotic Sciences and Systems (RSS)*, 2023
- C9 N. A. Dvorak, X. Yi, N. Fazeli, and P.-C. Ku, “Characterizations of gan nano-led-based tactile sensors for robotics applications,” in *Gallium Nitride Materials and Devices XVIII*, SPIE, 2023
- C10 Y. Wi, A. Zeng, P. Florence, and N. Fazeli, “Virido++: Real-world, visuo-tactile dynamics and perception of deformable objects,” *Conference on Robot Learning*, 2022
- C11 M. Oller, D. Berenson, and N. Fazeli, “Manipulation via membranes: High-resolution and highly deformable tactile sensing and control,” *Conference on Robot Learning*, 2022
- C12 M. van der Merwe, D. Berenson, and N. Fazeli, “Learning the dynamics of compliant tool-environment interaction for visuo-tactile contact servoing,” *Conference on Robot Learning*, 2022
- C13 Y. Chen, A. Sipos, M. van der Merwe, and N. Fazeli, “Visuo-tactile transformers for robotic manipulation,” *Conference on Robot Learning*, 2022
- C14 A. Sipos and N. Fazeli, “Simultaneous contact location and object pose estimation using proprioceptive tactile feedback,” *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2022

- C15 Y. Wi, P. Florence, A. Zeng, and N. Fazeli, “VirDo: Visio-tactile implicit representations of deformable objects,” *IEEE International Conference on Robotics and Automation (ICRA)*, 2022
- C16 A. Ajay, M. Bauza, J. Wu, N. Fazeli, J. B. Tenenbaum, A. Rodriguez, and L. P. Kaelbling, “Combining Physical Simulators and Object-Based Networks for Control,” *IEEE International Conference on Robotics and Automation (ICRA)*, 2019
- C17 A. Ajay, J. Wu, N. Fazeli, M. Bauza, L. P. Kaelbling, J. B. Tenenbaum, and A. Rodriguez, “Augmenting Physical Simulators with Stochastic Neural Networks: Case Study of Planar Pushing and Bouncing,” *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2018, **Best Cognitive Robotics Paper**
- C18 A. Zeng *et al.*, “Robotic Pick-and-Place of Novel Objects in Clutter with Multi-affordance Grasping and Cross-domain Image Matching,” *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 1–8, 2018, **Best Systems Paper – Amazon Manipulation Awards**
- C19 N. Fazeli, S. Zapolsky, E. Drumwright, and A. Rodriguez, “Learning Data-efficient Rigid-body Contact Models: Case Study of Planar Impact,” *Conference on Robotic Learning (CoRL)*, vol. 78, 2017
- C20 N. Fazeli, S. Zapolsky, E. Drumwright, and A. Rodriguez, “Fundamental Limitations in Performance and Interpretability of Common Planar Rigid-Body Contact Models,” *International Symposium of Robotic Research (ISRR)*, 2017
- C21 N. Fazeli, E. Donlon, E. Drumwright, and A. Rodriguez, “Empirical evaluation of common contact models for planar impact,” *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3418–3425, 2017
- C22 K.-T. Yu, M. Bauza, N. Fazeli, and A. Rodriguez, “More than a Million Ways to be Pushed. A High-Fidelity Experimental Data Set of Planar Pushing,” *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2016, (Best Paper Finalist)
- C23 K.-T. Yu, N. Fazeli, N. Chavan-Daffe, O. Taylor, E. Donlon, G. D. Lankenau, and A. Rodriguez, “A Summary of Team MIT’s Approach to the Amazon Picking Challenge 2015,” *arXiv preprint arXiv:1604.03639*, 2016
- C24 N. Fazeli, R. Tedrake, and A. Rodriguez, “Identifiability Analysis of Planar Rigid-body Frictional Contact,” *Robotics Research/International Symposium of Robotic Research 2015*, pp. 665–682, 2015, **Selected for Special Issue of IJRR**
- C25 M. Abdollahzade, C.-S. Kim, N. Fazeli, J.-O. Hahn, M. S. McMurtry, and B. Finegan, “Lossy Transmission Line Modeling of of Arterial Tree in Time Domain,” *36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, 2014
- C26 M. Rashedi, N. Fazeli, A. Chappell, S. Wang, R. MacArthur, M. S. McMurtry, B. Finegan, and J.-O. Hahn, “Modeling and System Identification of Arterial Hemodynamics in Humans,” *ASME Dynamic Systems and Control Conference (DSCC)*, 2013
- C27 N. Fazeli and J.-O. Hahn, “Active Non-Intrusive System Identification for Cardiovascular Monitoring: Part II Development of System Identification Algorithm,” *ASME Dynamic Systems and Control Conference (DSCC)*, 2013
- C28 N. Fazeli, C.-S. Kim, and J.-O. Hahn, “Non-invasive Estimation of Central Blood Pressure Waveform using a Dual Diametric Cuff System: a Preliminary Study,” *ASME Conference on Frontiers in Medical Devices: Applications of Computer Modeling and Simulation*, 2013
- C29 N. Fazeli, C. S. Kim, and J.-O. Hahn, “Quantification of Wave Reflection in the Arterial Tree via Diametric Blood Pressure Waveform Measurement,” *American Control Conference (ACC)*, 2013, 2013

- C30 N. Fazeli, M. Rashedi, A. Chappell, S. Wang, R. MacArthur, M. S. McMurtry, B. Finegan, and J.-O. Hahn, “Subject-specific Estimation of Aortic Blood Pressure via System Identification: Preliminary in-human Experimental Study,” *American Control Conference (ACC)*, 2013, pp. 740–745, 2013
- C31 N. Fazeli, H.-C. Kim, and J.-O. Hahn, “Active Non-Intrusive System Identification for Cardiovascular Monitoring: Part I—Excitation and Measurement Protocol Design,” *ASME Dynamic Systems and Control Conference (DSCC)*, pp. 543–551, 2012, **Best Paper Finalist**

Refereed Journal Articles:

- J1 X. Yi, A. Dang, and N. Fazeli, “Precise object sliding via asymmetric dual limit surfaces,” *Autonomous Robots Journal*, 2023
- J2 A. Sipos and N. Fazeli, “Multiscope: In-hand object pose estimation with proprioception and tactile feedback,” *International Journal of Robotics Research*, 2023
- J3 W. Van den Bogert, J. Lorenz, X. Yi, A. Shih, and N. Fazeli, “Lumped-parameter modeling and control for robotic high-viscosity fluid deposition,” *IEEE Robotics and Automation Letters (RA-L)*, 2023
- J4 N. Dvořák, N. Fazeli, and P.-C. Ku, “Direct shear stress mapping using a gallium nitride led-based tactile sensor,” *Micromachines*, vol. 14, no. 5, p. 916, 2023
- J5 S. Zhong, N. Fazeli, and D. Berenson, “Soft tracking using contacts for cluttered objects to perform blind object retrieval,” *IEEE Robotics and Automation Letters*, 2022
- J6 S. Zhong, Z. Zhang, N. Fazeli, and D. Berenson, “Tampc: A controller for escaping traps in novel environments,” *IEEE Robotics and Automation Letters*, 2021
- J7 N. Fazeli, M. Oller, J. Wu, Z. Wu, J. B. Tenenbaum, and A. Rodriguez, “See, feel, act: Hierarchical learning for complex manipulation skills with multisensory fusion,” *Science Robotics*, vol. 4, no. 26, 2019
- J8 A. Zeng *et al.*, “Robotic Pick-and-Place of Novel Objects in Clutter with Multi-Affordance Grasping and Cross-Domain Image Matching,” *International Journal of Robotic Research (IJRR)*, 2018
- J9 N. Fazeli, R. Kolbert, R. Tedrake, and A. Rodriguez, “Parameter and Contact Force Estimation of Planar Rigid-bodies Undergoing Frictional Contact,” *The International Journal of Robotics Research (IJRR)*, vol. 36, no. 13-14, pp. 1437–1454, 2017
- J10 C.-S. Kim, N. Fazeli, M. S. McMurtry, B. A. Finegan, and J.-O. Hahn, “Quantification of Wave Reflection using Peripheral Blood Pressure Waveforms,” *IEEE Journal of Biomedical and Health Informatics*, vol. 19, no. 1, pp. 309–316, 2015
- J11 C.-S. Kim, N. Fazeli, and J.-O. H. Hahn, “Data-Driven Modeling of Pharmacological Systems using Endpoint Information Fusion,” *Computers in Biology and Medicine*, vol. 61, pp. 36 – 47, 2015
- J12 M. Abdollahzade, C.-S. Kim, N. Fazeli, B. A. Finegan, M. S. McMurtry, and J.-O. Hahn, “Data-driven Lossy Tube-load Modeling of Arterial Tree: In-human Study,” *Journal of Biomechanical Engineering*, vol. 136, no. 10, p. 101011, 2014
- J13 N. Fazeli, C.-S. Kim, M. Rashedi, A. Chappell, S. Wang, R. MacArthur, M. S. McMurtry, B. Finegan, and J.-O. Hahn, “Subject-specific Estimation of Central Aortic Blood Pressure via System Identification: Preliminary In-human Experimental Study,” *Medical & Biological Engineering & Computing*, vol. 52, no. 10, pp. 895–904, 2014

J14 M. Rashedi, N. Fazeli, A. Chappell, S. Wang, R. MacArthur, M. S. McMurtry, B. A. Finegan, and J.-O. Hahn, “Comparative Study on Tube-load Modeling of Arterial Hemodynamics in Humans,” *Journal of Biomechanical Engineering*, vol. 135, no. 3, p. 031005, 2013

J15 N. Fazeli and J.-O. Hahn, “Estimation of Cardiac Output and Peripheral Resistance using Square-wave Approximated Aortic Flow Signal,” *Frontiers in Physiology*, vol. 3, p. 298, 2012

Patents:

1 W. van Den Bogert, A. Shih, N. Fazeli, ”Adjustable Inner-diameter Soft Nozzle to Achieve Variable Bead Dize for Direct Ink Writing Additive Manufacturing”

Invited Talks:

T1 N. Fazeli, “Dexterous multimodal robotic tool-use: From compliant tool representations to high-resolution tactile perception,” *Cornell Robotics Seminar Series*, 2023

T2 N. Fazeli, “Dexterous multimodal robotic tool-use: From compliant tool representations to high-resolution tactile perception,” *MIT Robotics Seminar Series*, 2023

T3 N. Fazeli, “Model-based tactile control with high resolution and highly compliant tactile sensors,” *IROS – RoboTac 2023 Visuo-Tactile Perception, Learning, Control for Manipulation and HRI*, 2023

T4 N. Fazeli, “Limit surfaces: A tutorial and recent advances,” *IROS – Workshop on Leveraging Models for Contact-Rich Manipulation*, 2023

T5 N. Fazeli, “Recent advances in learning multimodal implicit representations for deformable objects,” *RSS at KAIST*, 2023

T6 N. Fazeli, “Recent advances in learning multimodal implicit representations for deformable objects,” *3rd Workshop on Deformable Objects – ICRA*, 2023

T7 N. Fazeli, “Tactile control for contact rich tool-use,” *4th Annual CNU-HYU Joint Symposium*, 2023

T8 N. Fazeli, “Deformable object representations and tactile control for contact rich tool-use,” *UIUC Robotics Seminar*, 2022

T9 N. Fazeli, “Tactile dexterity and deformable object manipulation for osam,” *AFRL/AgMan UNM*, 2022

T10 N. Fazeli, “Visio-tactile object representations for forceful tool use,” *Sony AI*, 2021

T11 N. Fazeli, “Learning implicit representations for perception and manipulation of deformable objects,” *Google Robotics*, 2020

T12 N. Fazeli, “Visio-tactile object representations for forceful tool use,” *Samsung AI*, 2020

T13 N. Fazeli, “Towards robotic manipulation - understanding the world through contact,” *University of Pennsylvania, Electrical and Systems Engineering Department*, 2019

T14 N. Fazeli, “Towards robotic manipulation - understanding the world through contact,” *University of Michigan, Ann Arbor, Robotics Insitute and Mechanical Engineering*, 2019

T15 N. Fazeli, “Towards robotic manipulation - understanding the world through contact,” *University of Southern California, Aerospace and Mechanical Engineering Department*, 2019

T16 N. Fazeli, “Combining physical simulators and object-based networks for prediction and control,” *Conference on Neural Information Processing Systems (NeurIPS) – Workshop on Modeling the Physical World: Learning, Perception, and Control*, 2018

- T17 N. Fazeli, “See, Feel, Act: Learning Complex Manipulation Skills using Causal Structure and Multi-Sensory Fusion,” *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) – Workshop on Examining Sensing Modalities for Robust and Dexterous Object Manipulation*, 2018
- T18 N. Fazeli, “Towards High Fidelity Stochastic Simulators with Data-Augmented Models,” *Robotic Sciences and Systems – Workshop on Learning and Inference in Robotics: Integrating Structure, Priors and Models*, 2018
- T19 N. Fazeli, “Empirical Evaluation of Common Contact Models for Planar Impact,” *New England Manipulation Symposium (NEMS)*, 2017
- T20 N. Fazeli, “Identifiability Analysis of Planar Rigid-Body Frictional Contact,” *New England Manipulation Symposium (NEMS)*, 2015

Theses:

1. N. Fazeli, “Inference and Learning for Rigid-Body Models of Manipulation,” *Doctoral thesis submitted to the Department of Mechanical Engineering – Massachusetts Institute of Technology*, 2019
2. N. Fazeli, “An Active Non-Intrusive System Identification Approach for Cardiovascular Health Monitoring,” *Masters thesis submitted to the Department of Mechanical Engineering – University of Maryland at College Park*, 2014
3. N. Fazeli, “Active Vibration Attenuation of Vehicle Engine to Chassis using Adaptive FX-LMS Algorithms,” *Bachelors thesis submitted to the Department of Mechanical Engineering – Amirkabir University of Technology*, 2011

Students

Current PhD Students:

1. Miquel Oller
2. Youngsun Wi
3. Mark van Der Merwe (co-advised by Dmitry Berenson)
4. Xili Yi
5. Andrea Sipos
6. Samanta Rodriguez
7. William van Den Bogert (co-advised by Albert Shih)
8. James Lorenz (co-advised by Albert Shih)

Graduated PhD Students:

1. Sheng (Johnson) Zhong (co-advised by Dmitry Berenson)

Media Coverage

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| 2022 | Chess Playing Robot Breaks Child’s Finger in Russian Chess Tournament <i>Appeared on CNN and CNN New Day Podcast to comment on the topic.</i> |
| 2018 | See, Feel, Act: Hierarchical Learning for Complex Manipulation Skills with Multisensory Fusion <i>Covered in BBC, CNN, CBS, Tech Crunch, The Tech Review, The Times, Washington Post, Wired ...</i> |
| 2015 – 2017 | Amazon Picking Challenge <i>Covered in MIT Technology Review, MIT News, BetaBoston, EPR Retail ...</i> |
| 2016 | Fundamental Limitations of Rigid-body Contact Models <i>Feature on MIT’s Mechanical Engineering Website and Twitter.</i> |