Elizabeth "Bibit" Bianchini

I am a PhD student interested in data-efficient, dynamic robotic manipulation in contact-rich settings. Specifically, I work on model predictive control and rapidly building dynamics models of novel objects to enable robotic manipulation in the wild.

Roboticist, Mechanical Engineer
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Education

University of Pennsylvania - Ph.D. Mechanical Engineering *Expected 2026*
- Advised by Professor Michael Posa
- Thesis committee: Nadia Figueroa, Kostas Daniilidis, Jeannette Bohg (Stanford)

Stanford University - M.S. Mechanical Engineering, Mechatronics Specialization *Class of 2020*
Massachusetts Institute of Technology - B.S. Mechanical Engineering, Philosophy Concentration *Class of 2018*

Research Experience

Penn DAIR Lab - PhD Student, PI Michael Posa *Sept. 2020 to present*
Combines model-based and data-driven approaches to contact-rich robotic manipulation [1, 2, 3, 4].

Stanford Salisbury Robotics Lab - Graduate researcher and consultant, PI Ken Salisbury *Dec. 2019 to Sept. 2020*
Classified force data readings from UR5e robotic arm to interpret human touch gestures [5, 6].

Stanford CHARM Lab - Graduate researcher, PI Allison Okamura *March 2019 to June 2019*
Implemented the hardware and software for a haptic bracelet made with voice coils for use in virtual reality.

MIT Digital Structures Lab - Undergraduate researcher, PI Caitlin Mueller *Sept. 2014 to Dec. 2014*
Used Kuka robotic arm with 3D printer extruder to deposit material along non-planar FEA-identified stress lines.

Publications and Patents

*Asterisk denotes co-first authorship.

[1] S. Venkatesh*, B. Bianchini*, A. Aydinoglu, W. Yang, and M. Posa, "Approximating global contact-implicit mpc via sampling and local complementarity," *under review, arXiv preprint arXiv:2505.13350*, 2025. [Online]. Available: https://approximating-global-ci-mpc.github.io/

[2] B. Bianchini*, M. Zhu*, M. Sun, B. Jiang, C. J. Taylor, and M. Posa, "Vysics: Object reconstruction under occlusion by fusing vision and contact-rich physics," in *Robotics: Science and Systems (RSS)*, June 2025. [Online]. Available: https://vysics-vision-and-physics.github.io/

[3] B. Bianchini, M. Halm, and M. Posa, "Simultaneous learning of contact and continuous dynamics," in *Conference on Robot Learning*. PMLR, 2023, pp. 3966–3978. [Online]. Available: https://www.bianchini-love.com/posts/simultaneous-learning-of-contact-and-continuous-dynamics

[4] B. Bianchini, M. Halm, N. Matni, and M. Posa, "Generalization bounded implicit learning of nearly discontinuous functions," in *Learning for Dynamics and Control Conference*. PMLR, 2022, pp. 1112–1124. [Online]. Available: https://www.bianchini-love.com/posts/generalization-bounded-implicit-learning-of-nearly-discontinuous-functions

[5] B. Bianchini, P. Verma, and J. K. Salisbury, "Towards human haptic gesture interpretation for robotic systems," in *2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. IEEE, 2021, pp. 7334–7341. [Online]. Available: https://www.bianchini-love.com/posts/towards-human-haptic-gesture-interpretation-for-robotic-systems

[6] E. Bianchini, P. Verma, J. K. S. Jr., and E. Chassaing, "Systems and methods for tactile gesture interpretation," U.S. Patent Application US18/061,341, December, 2022. [Online]. Available: https://patents.google.com/patent/US20230173669A1

[7] E. Bianchini, "Fabricating sand cast parts for a herreshoff steam engine," Undergraduate Thesis, Massachusetts Institute of Technology, 2018, contribution to steam engine on display with permanent Herreshoff Exhibit at MIT Museum. [Online]. Available: https://www.bianchini-love.com/posts/herreshoff-steam-engine

[8] S. Resnick, E. Bianchini, K. Kocher, and A. McInroy, "Tool attachment for raking mortar joints," U.S. Patent 10,544,597, December, 2017. [Online]. Available: https://patents.google.com/patent/US10544597

Awards

John Goff Prize - awarded annually to a graduate student in the Department of Mechanical Engineering and Applied Mechanics, selected by the faculty on the basis of scholarship, resourcefulness, and leadership — *2025*

1st Place Best Workshop Paper - at RSS 2025 Navigating Contact Dynamics workshop — *2025*

Rising Star in Mechanical Engineering - selected as 1 of 30 for academic career workshop — *2024*

National Defense Science and Engineering Graduate (NDSEG) Fellow — *2020 to 2023*

National Science Foundation (NSF) Graduate Research (GRFP) Fellow (declined) — *2020*

Ford Foundation Predoctoral Scholar (declined) — *2020*

Threshold Ventures Fellow (formerly known as DFJ Fellowship) — *2019*

1st Place in Undergraduate Division, Collegiate Inventors Competition [8] — *2018*

Presentations, Workshops, Demos

RSS Navigating Contact Dynamics in Robotics Workshop - 1st place "best workshop paper" — *June 2025*
"Injecting Global Insights into Local Contact-Implicit MPC"

RSS Structured World Models for Robotic Manipulation Workshop - Accepted paper — *June 2025*
"Fusing Vision and Contact-Rich Physics Improves Object Reconstruction Under Occlusion"

University of Delaware RGSO Seminar Series - Invited speaker — *April 2025*
"Generalizable Contact-Rich Manipulation with Less Guidance" (event page)

CoRL "Differentiable Optimization" Workshop - Organizer — *Nov. 2024*
"Differentiable Optimization Everywhere: Simulation, Estimation, Learning, and Control" (website)

Penn MEAM Departmental Seminar - Invited speaker — *June 2024*
"Rapidly Understanding Novel Object Dynamics for Robotic Manipulation"

IROS Workshop on Leveraging Models for Contact-Rich Manipulation - Invited speaker — *Oct. 2023*
"Sampling-Based Model Predictive Control for Contact-Rich Manipulation" (presentation video)

Unstable Zeros Lab Group Meeting - Invited speaker — *March 2023*
"Robots Leaning into and Learning through Frictional Contact"

RSS Differentiable Simulation Workshop - Invited speaker — *July 2022*
"Avoiding Poor Generalizability of Differentiable Simulation" (presentation video)

ICRA Conference Student Demos - at conference with 4,500 attendees — *May 2022*
Live ContactNets demo of Franka arm throwing an object and reconstructing geometry from trajectory (demo video)

ICRA Workshop on Neural Implicit Geometry - Accepted paper — *May 2022*
"Simultaneously Learning Contact and Continuous Dynamics"

ICRA Workshop on Ethical Challenges of Lethal Autonomous Weapons Systems - Participant — *May 2022*

IROS Conference - Accepted paper and presentation — *Sept. 2021*
"Towards Human Haptic Gesture Interpretation for Robotic Systems" (presentation video)

Industry Experience

Robotics and AI Institute (formerly known as BDAI) - Research Intern — *May to Dec. 2023*
Joined a team aiming to equip robots to watch, understand, and perform new tasks on the fly.
Built an interactive, manipulation-based model-building process for learning dynamics models of novel objects.

Intuitive Surgical - Mechanical Engineering Intern — *June to Sept. 2019*
Designed an injection-molded subassembly for Ion, a lung biopsy robot.
Designed, fabricated, and validated an electromechanical test fixture for a system part.

Uber Advanced Technologies Group - Hardware Engineering Intern *June to Sept. 2017*
Compared 4 simulation methods against real-world data to guide simulation tool development.
Planned and executed testing to stress specific autonomous features on a test track.

Fitbit - Mechanical Engineering Intern *June to Aug. 2016*
Ran a cross-disciplinary project to balance electromechanical components with user considerations.
Oversaw the build of an injection-molded part at a factory in Shenzhen, China.

Carnegie Robotics - Mechanical Engineering Intern *June to Aug. 2015, 2014*
Generated 3D point cloud maps of city infrastructure for a confidential project.
Wrote data collection and analysis programs to quantify LIDAR scanner performance.

New Valence Robotics - Design Intern *Jan. 2015*
Worked for a startup providing schools with 3D printers and Common Core lesson plans utilizing the printers.
Headed a team of interns to generate lesson plans, CAD models, and documentation to teach students concepts.

Teaching Experience

Penn ENGR 1050 Introduction to Scientific Computing - Teaching Assistant *Aug. to Dec. 2023*
Developed assignments, held office hours, gave fill-in lectures for introductory Python course.

Penn MEAM 2110 Engineering Mechanics: Dynamics - Teaching Assistant *Jan. to June 2023*
Developed assignments, held recitations, gave fill-in lectures for undergraduate dynamics course.

Penn MEAM 520 Introduction to Robotics - Teaching Assistant *Jan. to June 2022*
Developed and ran written assignments and practical labs with Franka Panda robotic arms.

Stanford ME 218 Mechatronics Series - Teaching Assistant *Sept. 2019 to June 2020*
Collaboratively designed new game challenges for teams to design and construct competitive mechatronic systems.
Assisted with circuit design and implementation, and corresponding C and assembly programming.

Stanford Threshold Ventures Fellowship - Teaching Assistant *Jan. 2020 to June 2020*
Facilitated and moderated twice-weekly entrepreneurship-focused discussions and activities among 2020 cohort as part of Threshold Ventures (formerly known as DFJ) Fellowship, or TVF.

MIT 2.007 Robotics Pappalardo Apprenticeship - Teaching Assistant *Jan. to June 2018, 2017*
Assisted students in designing and fabricating their custom robots to compete in a new annual robotics challenge.
Sandcast and machined parts from original drawings of an 1897 Herreshoff steam engine, now on permanent display at the MIT Museum, as part of a collaborative Apprentice project documented in my undergraduate thesis [7].

Global Teaching Labs - Teacher *Jan. 2017, 2018*
Led students aged 8-15 at the American School of Tangier in Morocco and Tecnológico de Monterrey Guadalajara in Mexico through makerspace projects, including a PID-controlled balancing robot and electronic pinhole cameras.

Service and Mentorship

Francis Scott Key School - Career Day Presenter *May 15, 2025*
Presented to 4th and 6th grade students about being a researcher in robotics.

Polygence - Research Mentor *Jan. 2022 to present*
Mentor high school students through self-directed research projects, including writing robotics review papers.

Penn Diversity, Equity, and Inclusion (DEI) MEAM Task Force - DEI Scholar *Jan. 2022 to May 2025*
Develop and lead a DEI project to increase representation of under-represented groups in future PhD cohorts.

More Active Girls in Computic (MAGIC) - Project Mentor *Dec. 2020 to April 2022*
Mentor high school girls in independent mechatronics projects, including a hanging drawbot and autonomous car.

The Tech Challenge, San Jose Tech Museum - Team Mentor *Oct. 2018 to April 2020*
Mentor a middle school student team through building a hovercraft and catapult for the annual Tech Challenge.

MIT MakerWorkshop - Mentor, Milling Machine Specialist *Jan. to June 2018*
Trained and supervised MIT graduate and undergraduate students on safe milling machine use.

MIT Maker Lodge - Freshmen Mentor, CAD/CAM Training Chair *Sept. 2016 to June 2018*
Developed training curriculum and qualified MIT freshmen for campus machine shop use through equipment training.

Leadership

MIT Design for America (DFA) - President, Project Director *Sept. 2015 to June 2018*
Recruited and provided resources for 8 project teams to tackle real-world design problems in the local community.

MIT Camp Kesem - Camp Counselor *Sept. 2016 to Aug. 2018*
Coordinated a unit of kids aged 13-16 years whose parents are/were affected by cancer for a week-long camp.

MIT TechX, MakeMIT - 2016 Event Director *Sept. 2014 to June 2016*
Directed a committee to organize and raised $48K in corporate sponsorships for a 300 person hardware hackathon.

MIT Robotics Team - Executive Mechanical Engineer *Sept. 2014 to June 2016*
Designed and presented rovers at GITEX conference in Dubai, UAE for NASA Sample Return Centennial Challenge.