

Abhishek Cauligi

Assistant Professor – Johns Hopkins University

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Education

Ph.D. Aeronautics & Astronautics, Stanford University, 2021.

M.S. Aeronautics & Astronautics, Stanford University, 2018.

B.S. Aerospace Engineering, University of Michigan – Ann Arbor, 2016.

Research Interests

My research interests span the problems of planning and control for complex robotic systems. I am particularly interested in leveraging recent advances in nonlinear optimization, machine learning, and control theory towards:

1. Enabling safe and robust decision making for robotic systems under uncertainty.
2. Investigating the intersection and connections between optimal control and reinforcement learning.
3. Advancing the state-of-the-art in spacecraft robotic system development.

Professional Experience

Johns Hopkins University – Assistant Professor, Dept. of Mechanical Engineering, July 2025 – *present*.

NASA Jet Propulsion Lab – Robotics Technologist, Robotic Surface Mobility Group. March 2022 – April 2025.

Mitsubishi Electric Research Labs – Research Intern, Control & Autonomy Group. June – Sep. 2021.

NASA Jet Propulsion Lab – NSTRF Visiting Technologist, Robotic Aerial Mobility Group. June – Sep. 2019.

NASA Ames Research Center – NSTRF Visiting Technologist, Intelligent Robotics Group. Summers 2017 & 2018.

SpaceX – Guidance, Navigation, & Controls Intern, GNC Mission Design Group. May – Aug. 2016.

Planetary Resources. Attitude Dynamics & Controls Intern. Jan. – July 2015.

Honors and Awards

IEEE Robotics and Automation Magazine Best Paper Award, 2023.

NASA Space Technology Research Fellowship, 2016 – 2020.

NSF Graduate Research Fellowship Honorable Mention, 2016.

Univ. of Michigan College of Engineering's Scholarship of Honor (largest offered merit scholarship), 2012 – 2016.

The Boeing Company Endowed Scholarship, 2013 – 2014.

Univ. of Michigan William J. Branstrom Freshman Prize (top 5% of class), 2012 – 2013.

Advising & Mentoring

Doctoral Students

Sriram Kodey	2025 onwards.
Patrick Schwartz	2025 onwards.

Doctoral Committees

Carmine Buonagura, Politecnico di Milano (advised by Prof. Francesco Topputo)	2025
Julia Briden, MIT Aero/Astro (advised by Prof. Richard Linares)	2024

Mentoring

Kevin Fontana, ETH Zurich	2025
Federico Lozano, University of Malaga	2025
Kazuya Echigo, University of Washington	2023–2025
Tiberiu-Ioan Szatmari, Technical University of Denmark	2023–2024
Julia Briden, MIT	2022–2024

Academic Service

Reviewing

AIAA Journal of Guidance, Control, & Dynamics (JGCD)

Conference on Robot Learning (CoRL)

Distributed Autonomous Robotic Systems (DARS)

IEEE Conference on Decision & Control (CDC)

International Journal of Robotics Research (IJRR)

IEEE International Conference on Intelligent Robots and Systems (IROS)

IEEE Transactions on Robotics (T-RO)

IEEE Robotics and Automation Letters (RA-L)

IEEE Robotics & Automation Magazine (RAM)

International Symposium on Robotics Research (ISRR)

Teaching

Instructor, [EN.530.626: Trajectory Design for Space Systems](#), Fall 2025.

Press Coverage

1. Jill Wu, [AI advances robot navigation on the International Space Station](#). Stanford News. December 3, 2025.
2. Jennifer Kite-Powell, [This Gecko-Inspired Robotic Gripper Could Help Clean Up Space Junk](#). Forbes. May 20, 2021.
3. Allison Gasparini, [Stanford 'gecko gripper' tested on the International Space Station](#). Stanford News. May 20, 2021.
4. Gianine Figliozzi, [Sticking Around: Astrobbee tests gecko-inspired adhesives in space](#). NASA Ames newsletter. May 18, 2021.
5. Ingrid Fadelli, [A gecko-adhesive gripper for the Astrobbee free-flying robot](#). Tech Xplore. Oct. 20, 2020.

Academic Publications & Presentations

* denotes equal contribution.

Under Review

- [U1] F. Lozano-Cuadra, B. Soret, M. S. Net, A. **Cauligi**, and F. Rossi, "Decentralized graph attention-based multi-agent reinforcement learning for communications in autonomous lunar rover swarms," *IEEE Journal on Selected Areas in Communication*, 2026.

Journal Articles

- [J1] J. Briden, T. Gurga, B. Johnson, A. **Cauligi**, and R. Linares, "Transformer-based tight constraint prediction for efficient powered descent guidance," *AIAA Journal of Guidance, Control, and Dynamics*, vol. 48, no. 5,
- [J2] J. Briden, C. Choi, K. S. Yun, R. Linares, and A. **Cauligi**, "Constraint-informed learning for warm starting trajectory optimization," *AIAA Journal of Guidance, Control, and Dynamics*, vol. 48, no. 10, 2025. [arXiv 2312.14336](#).
- [J3] A. **Cauligi***, K. Albee*, J.-P. de la Croix, and R. Brockers, "CRESCENT: Collision-free highly-constrained trajectory optimization for driving on the moon," *IEEE Transactions on Field Robotics*, 2025.

- [J4] K. Echigo, A. **Cauligi**, S. Bandyopadhyay, D. Scharf, G. Lantoine, B. Açıkmeşe, and I. Nesnas, "Principled stochastic trajectory planning for asteroid reconnaissance," *AIAA Journal of Guidance, Control, and Dynamics*, 2025.
- [J5] D. Atha, M. R. Swan, A. **Cauligi**, A. Bettens, E. Goh, D. Kogan, L. Matthies, and M. Ono, "ShadowNav: Autonomous global localization for Lunar navigation in darkness," *IEEE Transactions on Field Robotics*, 2024. [arXiv 2405.01673](#).
- [J6] A. **Cauligi**, P. Culbertson, E. Schmerling, M. Schwager, B. Stellato, and M. Pavone, "CoCo: Online mixed-integer control via supervised learning," *IEEE Robotics and Automation Letters*, vol. 7, no. 2, pp. 1447–1454, 2022. [arXiv 2107.08143](#).
- [J7] T. G. Chen*, A. **Cauligi***, S. A. Suresh, M. Pavone, and M. R. Cutkosky, "Testing gecko-inspired adhesives with Astrobee aboard the ISS," *IEEE Robotics and Automation Magazine*, vol. 29, no. 3, pp. 24–33, 2022, **Winner of IEEE RAM Best Paper Award for 2023**.

Conference Papers

- [C1] S. Banerjee, A. **Cauligi**, and M. Pavone, "Deep learning warm starts for trajectory optimization on the international space station," in *IEEE Int. Conf. on Space Robotics*, 2025. [arXiv 2505.05588](#).
- [C2] J. Briden, T. Gurga, B. Johnson, A. **Cauligi**, and R. Linares, "Tight constraint prediction of six-degree-of-freedom transformer-based powered descent guidance," in *AIAA Scitech Forum*, 2025. [arXiv 2501.00930](#).
- [C3] J. Briden, B. Johnson, R. Linares, and A. **Cauligi**, "Diffusion policies for generative modeling of spacecraft trajectories," in *AIAA Scitech Forum*, 2025. [arXiv 2501.00915](#).
- [C4] K. Echigo, A. **Cauligi**, S. Bandyopadhyay, D. Scharf, G. Lantoine, B. Açıkmeşe, and I. Nesnas, "Autonomy in the real-world: Autonomous trajectory planning for asteroid reconnaissance via stochastic optimization," in *AIAA Scitech Forum*, 2025. [arXiv 2412.06816](#).
- [C5] F. Lozano-Cuadra, B. Soret, M. S. Net, A. **Cauligi**, and F. Rossi, "Learning decentralized routing policies via graph attention-based multi-agent reinforcement learning in lunar delay-tolerant networks," in *IEEE Int. Conf. on Space Robotics*, 2025. [arXiv 2510.20436](#).
- [C6] J. Briden, T. Gurga, B. Johnson, A. **Cauligi**, and R. Linares, "Improving computational efficiency for powered descent guidance via Transformer-based tight constraint prediction," in *AIAA Scitech Forum*, 2024. [arXiv 2311.05135](#), **Winner of 2024 AIAA GNC Graduate Student Paper Competition**.
- [C7] J.-P. de la Croix, F. Rossi, R. Brockers, D. Aguilar, K. Albee, E. Boroson, A. **Cauligi**, J. Delaune, et al., "Multi-agent autonomy for space exploration on the CADRE Lunar technology demonstration mission," in *IEEE Aerospace Conference*, 2024.
- [C8] K. Echigo, A. **Cauligi**, and B. Açıkmeşe, "Expected time-optimal control: A particle MPC-based approach via sequential convex programming," in *Proc. IEEE Conf. on Decision and Control*, 2024. [arXiv 2404.16269](#).
- [C9] A. **Cauligi***, M. R. Swan*, M. Ono, S. Daftry, J. Elliott, L. Matthies, and D. Atha, "ShadowNav: Crater-based localization for nighttime and permanently shadowed region lunar navigation," in *IEEE Aerospace Conference*, 2023. [arXiv 2301.04630](#).
- [C10] A. **Cauligi**, A. Chakrabarty, S. Di Cairano, and R. Quirynen, "PRISM: Recurrent neural networks and presolve methods for fast mixed-integer optimal control," in *Learning for Dynamics & Control*, 2022.
- [C11] A. **Cauligi***, T. Chen*, S. A. Suresh, M. Dille, R. G. Ruiz, A. M. Vargas, M. Pavone, and M. R. Cutkosky, "Design and development of a gecko-adhesive gripper for the Astrobee free-flying robot," in *Int. Symp. on Artificial Intelligence, Robotics and Automation in Space*, 2020. [arXiv 2009.09151](#).

- [C12] A. **Cauligi***, P. Culbertson*, B. Stellato, D. Bertsimas, M. Schwager, and M. Pavone, “Learning mixed-integer convex optimization strategies for robot planning and control,” in *Proc. IEEE Conf. on Decision and Control*, 2020. [arXiv:2004.03736](#).
- [C13] R. Bonalli, A. Bylard, A. **Cauligi**, T. Lew, and M. Pavone, “Trajectory optimization on manifolds: A theoretically-guaranteed embedded sequential convex programming approach,” in *Robotics: Science and Systems*, 2019. [arXiv:1905.07654](#).
- [C14] R. Bonalli, A. **Cauligi**, A. Bylard, and M. Pavone, “GuSTO: guaranteed sequential trajectory optimization via sequential convex programming,” in *Proc. IEEE Conf. on Robotics and Automation*, 2019. [arXiv:1903.00155](#).