

Kevin Tracy

✉ ktracy@cmu.edu • 🌐 kevintracy.info • 🔗 kevin-tracy • in kevin-tracy

Education

Carnegie Mellon University <i>Ph.D. Robotics, GPA 4.14/4</i> Advisor: Zac Manchester	Pittsburgh, PA 2020-Present
Stanford University <i>M.S. Mechanical Engineering, GPA 4.05/4</i> Advisor: Zac Manchester	Stanford, CA 2018-2020
Rice University <i>B.S. Mechanical Engineering, GPA 3.91/4</i>	Houston, TX 2014-2018

Research Experience

Carnegie Mellon University <i>Researcher, Robotic Exploration Laboratory</i> <ul style="list-style-type: none">Developing optimization-based motion planning and control algorithms.	Pittsburgh, PA Sep 2020–Present
Stanford University <i>Researcher, Robotic Exploration Laboratory</i> <ul style="list-style-type: none">Trajectory optimization for low-thrust orbit maneuvers and flexible-body attitude control.	Stanford, CA Jan 2018–Aug 2020

Professional Experience

Space Exploration Technologies (SpaceX) <i>Associate Engineer: Guidance, Navigation, and Control</i> <ul style="list-style-type: none">Implemented a novel closed-form solar array occlusion prediction algorithmWrote a primal-dual interior point solver for quadratic programs in C++Developed reaction wheel allocation algorithms using convex optimization	Hawthorne, CA May 2021–Aug 2021
Astranis Space Technologies <i>Guidance, Navigation, and Control Intern</i> <ul style="list-style-type: none">Built high-fidelity orbital simulation environment from scratch in JuliaImplemented fuel-optimal low-thrust trajectory methods for orbit-raisingDesigned orbital relocation algorithm for moving between GEO slotsDeveloped novel attitude control algorithms using convex optimization	San Francisco, CA Jan 2020–Mar 2020
Lockheed Martin Space Systems <i>Guidance, Navigation, and Control Intern</i> <ul style="list-style-type: none">Worked in GNC group for DOD Secret hypersonic and counter-hypersonic effortsDesigned hardware in the loop test setup for Multiple Object Kill Vehicle (MOKV)Contributed to 6-DOF hypersonic missile simulation toolsPublished a paper internally on attitude parameterization conventions at LM Space	Sunnyvale, CA July 2019–Sep 2019
Maxar Technologies (Formerly Space Systems/Loral) <i>Spacecraft Systems Intern</i> <ul style="list-style-type: none">Completed three internships in the spacecraft systems engineering organizationCreated subsystem models for attitude control, solar array, and electric power subsystem sizing in MATLAB for Monte Carlo optimization of spacecraft architectureRedesigned equipment list system for bus subsystems and provided relevant training for engineers	Palo Alto, CA May 2016–Sep 2018

Teaching Experience

Carnegie Mellon University <i>Teaching Assistant, 16745: Optimal Control and Reinforcement Learning</i> <i>Teaching Assistant, 16715: Advanced Robot Dynamics and Simulation</i>	Pittsburgh, PA Spring 2022 Fall 2021
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Stanford University
Teaching Assistant, AA273: State Estimation and Filtering for Robotic Perception
Teaching Assistant, ENGR205: Introduction to Control Design Techniques

Rice University
Teaching Assistant, ENGI120: Introduction to Engineering Design
Teaching Assistant, STAT305: Statistics for Biosciences

Stanford, CA
Spring 2020
Fall 2019

Houston, TX
Fall 2016, 2017
Fall 2015

Awards

Best Paper (Avionics and Electronics for Space Applications)

IEEE Aerospace Conference 2022
"Ultra-Fine Pointing for Nanosatellite Telescopes With Actuated Booms"

Best Student Paper Finalist

IEEE Robotics and Automation Society 2021
"Planning with Attitude"

Publications

Journal Papers

1. B. E. Jackson, K. Tracy, and Z. Manchester, "Planning With Attitude," en, *IEEE Robotics and Automation Letters*, 2021.
2. E. S. Douglas, K. Tracy, and Z. Manchester, "Practical Limits on Nanosatellite Telescope Pointing: The Impact of Disturbances and Photon Noise," en, *Frontiers in Astronomy and Space Sciences*, vol. 8, Aug. 2021.

Preprints

3. K. Tracy, *A Square-Root Kalman Filter Using Only QR Decompositions*, Aug. 2022. arXiv: 2208.06452 [cs, eess].
4. K. Tracy, T. A. Howell, and Z. Manchester, *Differentiable Collision Detection for a Set of Convex Primitives*, Jul. 2022. arXiv: 2207.00669 [cs].
5. K. Tracy, T. A. Howell, and Z. Manchester, *DiffPills: Differentiable Collision Detection for Capsules and Padded Polygons*, Jul. 2022. arXiv: 2207.00202 [cs].

Conference Papers

6. K. Tracy, G. Falcone, and Z. Manchester, "Robust Entry Guidance with Atmospheric Adaptation," in *AIAA SciTech Forum and Exposition*, National Harbor, Maryland, Jan. 2023.
7. B. E. Jackson, J. H. Lee, K. Tracy, and Z. Manchester, "Data-Efficient Model Learning for Control with Jacobian-Regularized Dynamic-Mode Decomposition," in *6th Annual Conference on Robot Learning*, Dec. 2022.
8. T. A. Howell, K. Tracy, K. Le Cleac'h, and Z. Manchester, "CALIPSO: A Differentiable Solver for Trajectory Optimization with Conic and Complementarity Constraints," in *The International Symposium on Robotics Research*, Geneva, Switzerland, Sep. 2022. arXiv: 2205.09255 [cs, eess].
9. M. Holliday, K. Tracy, Z. Manchester, and A. Nguyen, "The V-R3x Mission: Towards Autonomous Networking and Navigation for CubeSat Swarms," in *4S Symposium*, Vilamoura, Portugal, May 2022.
10. K. Tracy and Z. Manchester, "CPEG: A Convex Predictor-corrector Entry Guidance Algorithm," in *IEEE Aerospace Conference*, Big Sky, MT, USA, Mar. 2022.
11. K. Tracy, Z. Manchester, and E. Douglas, "Ultra-Fine Pointing for Nanosatellite Telescopes With Actuated Booms," in *IEEE Aerospace Conference*, Big Sky, MT, USA, Mar. 2022.
12. B. E. Jackson, T. Punnoose, D. Neamati, K. Tracy, R. Jitosh, and Z. Manchester, "ALTRO-C: A Fast Solver for Conic Model-Predictive Control," in *2021 IEEE International Conference on Robotics and Automation (ICRA)*, Xi'an, China, May 31, 2021.
13. K. Tracy and Z. Manchester, "Low-Thrust Trajectory Optimization Using the Kustaanheimo-Stiefel Transformation," in *AAS/AIAA Space Flight Mechanics Meeting*, Charlotte, NC, Jan. 31, 2021.
14. K. Tracy and Z. Manchester, "Model-Predictive Attitude Control for Flexible Spacecraft During Thruster Firings," in *AAS/AIAA Astrodynamics Specialist Conference*, Lake Tahoe, CA, Aug. 9, 2020.