

Pio Ong

Curriculum Vitae

Department of Mechanical and Civil Engineering
California Institute of Technology (Caltech)

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Website: <https://pioong.github.io>

RESEARCH CAREER

Postdoctoral Researcher (January 2022 - current)

Institution: Caltech, Supervisor: Prof. Aaron D. Ames

PhD Candidate (September 2016 - December 2021)

Institution: University of California, San Diego (UCSD), PhD Advisor: Prof. Jorge Cortés

RESEARCH INTERESTS

- Control barrier functions for safety-critical systems
- Event-triggered control for resource-aware controls
- Resilient autonomy in adversarial environments
- Analysis and controls of network systems
- Control applications in multi-agent and aerospace systems

PROFESSIONAL EXPERIENCE

Mission Assurance Engineer (September 2014- March 2015)

Institution: Space Exploration Technologies Corporation (SpaceX)

- Ensured flight readiness through risk assessment and mitigation for Falcon 9 Launch vehicles.

EDUCATION

University of California, San Diego (UCSD)

March 2022

PhD, Dynamic Systems and Controls

GPA: 4.00

Advisor: Prof. Jorge Cortés

University of Southern California (USC)

December 2013

M.S., Astronautical Engineering

GPA: 4.00

University of California, San Diego (UCSD)

June 2012

B.S., Aerospace Engineering

GPA: 3.87

PUBLICATIONS

Journal Articles

- (J-8) **P. Ong**, H. Lee, T. G. Molnar, D. Panagou, and A. D. Ames. Combinatorial control barrier functions: Nested Boolean and p -choose- r compositions of safety constraints. *IEEE Control Systems Letters*, 9:2705–2710, 2025
- (J-7) **P. Ong**, Y. Xu, R. M. Bena, F. Jabbari, and A. D. Ames. Matrix control barrier functions. *IEEE Transactions on Automatic Control*, 2025. Submitted
- (J-6) **P. Ong**, M. H. Cohen, T. G. Molnar, and A. D. Ames. Rectified control barrier functions for high-order safety constraints. *IEEE Control Systems Letters*, 8:2949–2954, 2024
- (J-5) **P. Ong** and J. Cortés. Performance-barrier-based event-triggered control with applications to network systems. *IEEE Transactions on Automatic Control*, 69(7):4230–4244, 2024
- (J-4) M. H. Cohen, **P. Ong**, G. Bahati, and A. D. Ames. Characterizing smooth safety filters via the implicit function theorem. *IEEE Control Systems Letters*, 7:3890–3895, 2024

- (J-3) **P. Ong**, B. Capelli, L. Sabattini, and J. Cortés. Nonsmooth control barrier function design of continuous constraints for network connectivity maintenance. *Automatica*, 156:111209, 2023
- (J-2) A. J. Taylor, **P. Ong**, J. Cortés, and A. Ames. Safety-critical event triggered control via input-to-state safe barrier functions. *IEEE Control Systems Letters*, 5(3):749–754, 2021
(The first two authors contributed equally.)
- (J-1) **P. Ong** and J. Cortés. Opportunistic robot control for interactive multiobjective optimization under human performance limitations. *Automatica*, 123:109263, 2021

Conference Proceedings

- (C-21) P. Mestres, S. S. Mousavi, **P. Ong**, L. Yang, E. Das, J. W. Burdick, and A. D. Ames. Explicit control barrier function-based safety filters and their resource-aware computation. In *IFAC World Congress*, Busan, South Korea, August 2026. Submitted
- (C-20) M. H. Cohen, **P. Ong**, and A. D. Ames. Input-to-state safe backstepping: Robust safety-critical control with unmatched uncertainties. In *American Control Conference*, New Orleans, LA, May 2026. Submitted
- (C-19) M. de Sa, **P. Ong**, and A. D. Ames. From bundles to backstepping: Geometric control barrier functions for safety-critical control on manifolds. In *American Control Conference*, New Orleans, LA, May 2026. Submitted
- (C-18) **P. Ong**, H. Lee, T. G. Molnar, D. Panagou, and A. D. Ames. Combinatorial control Barrier functions: Nested boolean and p -choose- r compositions of safety constraints. In *American Control Conference*, New Orleans, LA, May 2026. Submitted
- (C-17) X. Tan, **P. Ong**, P. Tabuada, and A. D. Ames. Secure safety filter design for sampled-data nonlinear systems under sensor spoofing attacks. In *IEEE Conf. on Decision and Control*, Rio De Janeiro, Brazil, December 2025. To appear
- (C-16) **P. Ong**, M. H. Cohen, T. G. Molnar, and A. D. Ames. On the properties of optimal-decay control barrier functions. In *IEEE Conf. on Decision and Control*, Rio De Janeiro, Brazil, December 2025. To appear
- (C-15) X. Tan, J. Sundar, R. Bruzzone, **P. Ong**, W. T. Lunardi, M. Andreoni, P. Tabuada, , and A. D. Ames. Secure safety filter: Towards safe flight control under sensor attacks. In *IEEE/RSJ Int. Conf. on Intelligent Robots & Systems*, Hangzhou, China, October 2025. To appear
- (C-14) X. Tan, **P. Ong**, P. Tabuada, and A. D. Ames. Computationally efficient safe control of linear systems under severe sensor attacks. In *American Control Conference*, pages 4383–4390, Denver, CO, July 2024
- (C-13) **P. Ong**, M. H. Cohen, T. G. Molnar, and A. D. Ames. Rectified control barrier functions for high-order safety constraints. In *American Control Conference*, Denver, CO, July 2025
- (C-12) **P. Ong**, M. Mazo Jr., and A. D. Ames. Hierarchical event-triggered systems: Safe learning of quasi-optimal deadline policies. In *IEEE Conf. on Decision and Control*, pages 4455–4461, Milan, Italy, December 2024
- (C-11) X. Tan, **P. Ong**, P. Tabuada, and A. D. Ames. Safety of linear systems under severe sensor attacks. In *IEEE Conf. on Decision and Control*, pages 336–342, Milan, Italy, December 2024
- (C-10) G. Bahati, **P. Ong**, and A. D. Ames. Sample-and-hold safety with control barrier functions. In *American Control Conference*, pages 5169–5176, Toronto, Canada, July 2024
- (C-9) M. H. Cohen, **P. Ong**, G. Bahati, and A. D. Ames. Characterizing smooth safety filters via the implicit function theorem. In *American Control Conference*, Toronto, Canada, July 2024
- (C-8) **P. Ong** and A. D. Ames. Intermittent safety filters for event-triggered safety maneuvers with application to satellite orbit transfers. In *IEEE Conf. on Decision and Control*, pages 870–877, Marina Bay Sands, Singapore, December 2023

- (C-7) **P. Ong**, G. Bahati, and A. D. Ames. Stability and safety through event-triggered intermittent control with application to spacecraft orbit stabilization. In *IEEE Conf. on Decision and Control*, pages 453–460, Cancún, Mexico, December 2022
- (C-6) A. J. Taylor, **P. Ong**, T. G. Molnar, and A. D. Ames. Safe backstepping with control barrier functions. In *IEEE Conf. on Decision and Control*, pages 5775–5782, Cancún, Mexico, December 2022
- (C-5) **P. Ong**, B. Capelli, L. Sabattini, and J. Cortés. Network connectivity maintenance via nonsmooth control barrier functions. In *IEEE Conf. on Decision and Control*, pages 4780–4785, Austin, Texas, December 2021 (The first two authors contributed equally.)
- (C-4) A. J. Taylor, **P. Ong**, J. Cortés, and A. Ames. Safety-critical event triggered control via input-to-state safe barrier functions. In *IEEE Conf. on Decision and Control*, Jeju Island, Republic of Korea, December 2020 (The first two authors contributed equally.)
- (C-3) **P. Ong** and J. Cortés. Universal formula for smooth safe stabilization. In *IEEE Conf. on Decision and Control*, pages 2373–2378, Nice, France, December 2019
- (C-2) **P. Ong** and J. Cortés. Event-triggered control design with performance barrier. In *IEEE Conf. on Decision and Control*, pages 951–956, Miami Beach, Florida, December 2018
- (C-1) **P. Ong** and J. Cortés. Event-triggered interactive gradient descent for real-time multi-objective optimization. In *IEEE Conf. on Decision and Control*, pages 5445–5450, Melbourne, Australia, December 2017

PROFESSIONAL SERVICES

Workshop Organizer

ICRA’25 Robot Safety under Uncertainty from “Intangible” Specification
 40th Southern California Control Workshop at Caltech
 37th Southern California Control Workshop at UC San Diego

Conference Session Chair

CDC 2025: Constrained Control I, to attend
 ACC 2024: Sampled-data Control

Program Committee Member

ICRA’21 Workshop on Safe Robot Control with Learned Motion and Environment Models

Leadership and Outreach

NextCom Ambassador, IEEE Conference on Decision and Control (CDC) 2025
 - Leadership role supporting student and early-career researcher engagement

Graduate Admissions Reviewer

Caltech, 2025 admissions cycle
 - Reviewed graduate applications for the Robotics, Controls, and Dynamics program in Mechanical and Civil Engineering and the Control and Dynamical Systems program in Computing and Mathematical Sciences.
 - Evaluated applicant profiles in collaboration with other postdoctoral researchers and provided recommendations to the admissions committees.

Reviewer for Journals

IEEE Control Systems Letters, IEEE Transactions on Automatic Control, Automatica, IEEE Access, Nonlinear Analysis: Hybrid Systems, IEEE Transactions on Cybernetics, IEEE Transactions on Control of Network Systems, International Journal of Adaptive Control and Signal Processing, IEEE Robotics and Automation Letters, IEEE Open Journal of Control Systems

Reviewer for Conferences

IEEE Conference on Decision and Control (CDC), IEEE International Conference on Robotics and Automation (ICRA), American Control Conference (ACC), International Symposium on Mathematical Theory of Networks and Systems (MTNS), IFAC Conference on Modeling, Identification, and Control of Nonlinear Systems

TEACHING EXPERIENCE

Lecturer

Feedback Systems, Caltech (Spring 2023)

Teaching Assistant

Nonlinear Control, UCSD (Spring 2018, Spring 2019, Spring 2020), Instructor: Prof. Jorge Cortés,

MENTORING

Gilbert Bahati, PhD Candidate

Edward Ju, Undergraduate Student

GRANT WRITING EXPERIENCE

- Assisted in developing a collaborative research proposal (Caltech, Wayne State University, NASA JPL) for the U.S. Air/Space Force, contributing research ideas and drafting portions of the technical proposal.
- Reviewed and provided feedback on a research proposal submitted to the Technology Innovation Institute (TII), ensuring technical soundness in areas of expertise.

AWARDS AND HONORS

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| • Outstanding Reviewer
IEEE Control Systems Letters (L-CSS) | 2020 |
| • Teaching Assistant Commendation
Department of Mechanical and Aerospace Engineering, UCSD | 2020 |