Pol Mestres

PhD Student · Systems and Control

pol@ucsd.edu | polmestres.github.io | PolMestres | b84753164

Academic Positions

California Institute of Technology (Caltech) *Pasadena, California, USA*

Postdoctoral Scholar *08 2025 - present*

- Advisor: Dr. Aaron Ames

Education

University of California, San Diego *La Jolla, California, USA*

PhD Mechanical Engineering *09 2020 - 07 2025*

- Advisor: Dr. Jorge Cortés
- Research topics: safety-critical control, motion planning, safe reinforcement learning, optimization-based controllers

University of California, San Diego *La Jolla, California, USA*

MS Mechanical Engineering *09 2020 - 07 2021*

- GPA: 3.966.
- Specialization in Dynamical Systems and Control
- Coursework: Linear Systems, Parametric Identification, Cooperative Control of Multiagent Systems, Nonlinear Systems, Optimal Estimation, Convex Optimization, Nonlinear Control, Linear Control Design, Optimal Control, Hybrid Systems.

Universitat Politècnica de Catalunya *Barcelona, Spain*

BS Mathematics, BS Engineering Physics *09 2015 - 06 2020*

- Bachelor's Thesis at the University of California, San Diego, (10/10 with honors).

Publications[1]

Journal Publications

11.- P. Mestres, A. Marzabal, and J. Cortés. Off-Policy Reinforcement Learning with Anytime Safety Guarantees via Robust Safe Gradient Flow, IEEE Transactions on Automatic Control, submitted.

10.- P. Mestres, Y. Chen, E. Dall'anese, and J. Cortés. Control Barrier Function-Based Safety Filters: Characterization of Undesired Equilibria, Unbounded Trajectories, and Limit Cycles, Journal of Nonlinear Science, submitted.

9.- P. Mestres, C. Nieto-Granda, and J. Cortés. Safe and Dynamically-Feasible Motion Planning using Control Lyapunov and Barrier Functions, IEEE Transactions on Robotics, submitted.

8.- Y.Chen, P. Mestres, J. Cortés, and E. Dall'Anese. Equilibria and Their Stability Do Not Depend on the Control Barrier Function in Safe Optimization-Based Control, Automatica, submitted.

7.- P. Mestres and J. Cortés, Converse Theorems for Certificates of Safety and Stability. IEEE Transactions on Automatic Control, to appear.

6.- P. Mestres, C. Nieto-Granda and J. Cortés, Distributed Safe Navigation of Multi-Agent Systems using Control Barrier Function-Based Optimal Controllers. IEEE Robotics and Automation Letters, 9 (7) (2024), 6760-6767.

5.- P. Mestres, A. Allibhoy and J. Cortés. Regularity Properties of Optimization-Based Controllers. European Journal of Control 81 (2025), 101098, Keynote Invited Paper.

4.- P. Mestres, K. Long, N. Atanasov and J. Cortés. Feasibility Analysis and Regularity Characterization of Distributionally Robust Safe Stabilizing Controllers. IEEE Control Systems Letters, vol. 8 (2024), pp. 91-96.

3.- P. Mestres and J. Cortés. Feasibility and Regularity Analysis of Safe Stabilizing Controllers under Uncertainty. Automatica, vol. 167, pp. 111800 (2024).

[1] * denotes equal contribution

2.- P. Mestres and J. Cortés. Optimization-Based Safe Stabilizing Feedback with Guaranteed Region of Attraction. IEEE Control Systems Letters (with joint submission to 61st IEEE Conference on Decision and Control), 7 (2023), 367-372.

1.- M. Vaquero, P. Mestres, J. Cortés. Resource-Aware Discretization of Accelerated Optimization Flows. IEEE Transactions on Automatic Control, 68 (4) (2023).

Conference Publications

8.- P. Mestres, B. Werner, R. K. Cosner, and A. D. Ames, Probabilistic Control Barrier Functions: Safety in Probability for Discrete-Time Stochastic Systems, 2026 American Control Conference, submitted.

7.- P. Mestres, J. Cortés, and E. D. Sontag, Neural Network-based Universal Formulas for Control, submitted.

6.- G. Delimpaltadakis*, P. Mestres*, J. Cortés, and W. M. P. H. Heemels, Feedback Optimization with State Constraints through Control Barrier Functions, 64th IEEE Conference on Decision and Control, to appear.

5.- P. Mestres, A. Marzabal and J. Cortés, Anytime Safe Reinforcement Learning, 7th Annual Learning for Dynamics and Control Conference, to appear.
Selected for Oral Presentation. Nominated for Best Paper Award Finalist

4.- Y. Chen*, P. Mestres*, E. Dall'anese and J. Cortés, Characterization of the Dynamical Properties of Safety Filters for Linear Planar Systems, 63rd IEEE Conference on Decision and Control, Milan, Italy, 2024 pp. 8858-8863.

3.- P. Mestres, K. Long, M. Leok, N. Atanasov and J. Cortés, Stabilization of Nonlinear Systems through Control Barrier Functions, 63rd IEEE Conference on Decision and Control, Milan, Italy, 2024, pp. 2397-2402.

2.- P. Mestres, J. Cortés. 2023. Distributed and Anytime Algorithm for Network Optimization Problems with Separable Structure. Proceedings of the 62nd IEEE Conference on Decision and Control, Singapore, 2023, pp. 5457-5462.

1.- P. Mestres, J. Cortés. 2022. Safe Design for Controlling Epidemic Spreading under Heterogeneous Testing Capabilities. Proceedings of the American Control Conference, Atlanta, Georgia, USA, 2022, pp. 697-702 .

Talks

June 2025. Anytime Safe Reinforcement Learning. L4DC 2025.

May 2025. Distributed Safe Navigation of Multi-Agent Systems using Control Barrier Function-Based Optimal Controllers. ICRA 2025.

April 2024. Distributed Safe Navigation using Control Barrier Functions. Poster session at the MAE Department 60th Year Anniversary Celebration. UC San Diego.

March 2024. Dynamical Limitations of CBF-based Safety Filters and a Hierarchical Control Solution. AMBER Lab, Caltech.

December 2024. Stabilization of Nonlinear Systems through Control Barrier Functions. 63rd IEEE Conference on Decision and Control. Milan, Italy.

December 2024. Characterization of the Dynamical Properties of Safety Filters for Linear Planar Systems. 63rd IEEE Conference on Decision and Control. Milan, Italy.

November 2024. Dynamical Properties of Control Barrier Function-Based Safety Filters. 44th Southern California Controls Workshop. University of Southern California.

April 2024. Distributed Safe Navigation using Control Barrier Functions. Poster session. Jacobs School of Engineering Research Expo 2024. UC San Diego

December 2022. *Optimization-Based Safe Stabilizing Feedback with Guaranteed Region of Attraction*. Regular session at the 61st IEEE Conference on Decision and Control. Cancún, Mexico.

November 2022. *Optimization-Based Controllers for Safety-Critical Systems*. Robograds. UC San Diego.

June 2022. *Optimization-Based Safe Stabilizing Feedback with Guaranteed Region of Attraction*. Poster Session at the SoCal Hub Workshop on Secure Autonomy, University of California, Riverside, USA.

June 2022. *Safe Policy Design for Controlling Epidemic Spreading under Heterogeneous Testing Capabilities* Rapid Interactive Session at the 2022 American Control Conference, Atlanta, Georgia, USA.

Awards, Fellowships, & Grants

2025	**Mechanical and Aerospace Engineering Outstanding Graduate Student Award**, UCSD
2020-2021	**MAE First Year Fellowship**, Department of Mechanical and Aerospace Engineering, UCSD
2015-2020	**CFIS Tuition and Housing Fellowship**, CFIS-UPC
2018	**Finalist - HackUPC**, Universitat Politècnica de Catalunya
2018	**Winner - Datathon CFIS**, Centre de Formació Interdisciplinària Superior (CFIS)
2015	**Excellence Distinction on the University Entrance Exam**, Generalitat de Catalunya
2015	**Silver Medal in Spanish Physics Olympiad**, Real Federación Española de Física
2015	**Silver Medal in Catalan Physics Olympiad**, Societat Catalana de Física

Teaching Experience

Spring 2024	**MAE 281b (Nonlinear Control)**, Teaching Assistant
Fall 2024	**MAE 286 (Hybrid Systems)**, Teaching Assistant

Mentoring

Summer 2024	**Jingyi Zhong**, Undergraduate, University of Southampton. Visiting student.
Summer 2024	**Jiayi Yan**, Undergraduate, The Chinese University of Hong Kong, Shenzhen. International Student Research Program
Fall 2024	**Arnau Marzabal**, Undergraduate, Universitat Politècnica de Catalunya. Bachelor's Thesis Mobility Program

Outreach & Professional Development

Peer Review

IEEE Transactions on Automatic Control
IEEE Conference on Decision and Control
International Conference on Robotics and Automation (ICRA)
IEEE Robotics and Automation Letters
Learning for Dynamics and Control Conference
American Control Conference
European Control Conference
IEEE Transactions on Control of Network Systems
Automatica
IEEE Transactions on Control Systems Technology
International Journal of Robust and Nonlinear Control
IEEE Open Journal of Control Systems
International Conference on Automation Science and Engineering (CASE)
Nonlinear Analysis: Hybrid Systems
IEEE Transactions on Industrial Electronics
IEEE Transactions on Automation Science and Engineering

Conference and Workshop Organization

45th Southern California Control Workshop

Service

Member of the Control Systems Society (CSS) Technical Committee on Networks
UCSD Robograds - Treasurer (School year 2023-2024)

Professional Memberships

IEEE Student Member
SIAM Student Member

Professional Experience

U.S. Army DEVCOM Army Research Laboratory *Adelphi, Maryland*
Research Intern *06 2024 - 09 2024*

- Design of dynamically feasible motion planning algorithms and implementation in simulation and hardware in robotic platoforms such as Clearpath Jackal and Husky robots.

U.S. Army DEVCOM Army Research Laboratory *Adelphi, Maryland*
Research Intern *06 2023 - 09 2023*

- ROS implementation of safe navigation algorithms for multi-agent systems. The algorithm was tested in simulation and in real robotic platforms, such as Clearpath Jackal and Husky robots.

Barcelona Supercomputing Center - Computational Biology Group *Barcelona, Spain*
Research Intern *06 2019 - 08 2019*

- Data science for epigenetics. Reconstruction of cell differentation trees through epigenetic data such as hi-c chromatine contacts, histone marks data, etc.

BaseTIS *Barcelona, Spain*
Data Science Intern *06 2018 - 08 2018*

- Machine learning techniques for image recognition.

Institut de Robòtica Industrial (IRI) *Barcelona, Spain*
Research Intern *06 2017 - 08 2017*

- Detection of variable symmetries in constraint satisfaction problems.

Skills

Programming: Python, C++, MATLAB, R, AMPL, Mathematica.
Software: ROS, Linux, LaTeX, LabVIEW.
Languages: Catalan (native), Spanish (native), English (fluent), French (basic).