

Daniel E. Ochoa

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[Google Scholar](#)

EDUCATION

- 2024 **Ph.D.**, Electrical and Computer Engineering, University of California, San Diego
 Dissertation: “[Robust Feedback Mechanisms for Fast and Global Decision-Making and Control](#)”
 [Chair: Dr. Jorge I. Poveda]
- 2022 **M.Sc.**, Electrical and Computer Engineering, University of Colorado, Boulder
- 2019 **M.Sc.**, Electronics and Computer Engineering, Universidad de los Andes, Colombia
 Thesis: “[Deep Reinforcement Learning and Population Dynamics for Water Systems Control](#)”
- 2017 **B.Sc.**, Electrical Engineering, *Cum Laude*, Universidad de los Andes, Colombia
 Thesis: “[On the Implementation of Control Strategies for a Physical Drainage Model](#)”
- 2017 **B.Sc.**, Physics, Universidad de los Andes, Colombia
 Thesis: “[A Versatile Setup for the Observation of Different Quantum Phenomena](#)”

CURRENT POSITION

- 2024 – present **Postdoctoral Scholar**, Electrical and Computer Engineering, UC Santa Cruz
Hybrid Systems Laboratory, Advisor: Dr. Ricardo G. Sanfelice
- Developed non-Euclidean contraction and incremental stability theory for constrained differential inclusions, yielding global asymptotic stability certificates for compact attractors.
 - Characterized solution sets and extremal solutions of geometric hybrid dynamical systems.
 - Extended hybrid inclusions to time-varying dynamics with measurable-in-time flow maps.
 - Established approximation guarantees for neural hybrid equations on compact time domains, and built a structure-preserving differentiable solver in Julia.
 - Standardized group documentation with shared experiment and meeting-note templates.
 - Mentored Ph.D. candidates Piyush P. Jirwankar (geometric hybrid systems; four papers [C10, C15, U1, P3]) and Carlos A. Montenegro (stochastic hybrid systems; two papers [C13, C14]). See Publications.

HONORS and AWARDS

- 2026 Postdoctoral Fellowship, Alliance of Hispanic Serving Research Universities (HSRU) [1 of 26 selected]
- 2025 Robert Skelton Systems and Control Best Ph.D. Dissertation Award, Center for Control Systems and Dynamics, UCSD
- 2024 Young Author Award, 8th IFAC Conference on Analysis and Design of Hybrid Systems
- 2024 iREDEFINE Professional Development Award, Electrical and Computer Engineering Department Heads Association
- 2022 NSF Rising Star in Cyber-Physical Systems, University of Virginia [1 of 31 selected]
- 2019 Dean’s Graduate Assistantship Fellowship, College of Engineering, University of Colorado, Boulder

PUBLICATIONS

27 peer-reviewed papers (11 journal articles, 16 conference papers), 19 as first author. The work spans hybrid dynamical systems, optimization-based control, contraction theory, and learning-based and data-driven methods, with applications to autonomous systems and to power, traffic, and water networks.

Peer-reviewed Journal Articles

- 2026 [J11] Ochoa, D. E., and J. I. Poveda. “Prescribed-Time and Hyperexponential Concurrent Learning with Partially Corrupted Datasets: A Hybrid Dynamical Systems Approach.” *Nonlinear Analysis: Hybrid Systems*.
- 2025 [J10] Ochoa, D. E., M. Abdelgalil, and J. I. Poveda. “On the Instability of Nesterov’s ODE under Non-Conservative Vector Fields.” *IEEE Control Systems Letters*.
- 2025 [J9] Ochoa, D. E., and J. I. Poveda. “Robust Global Optimization on Smooth Compact Manifolds via Hybrid Gradient-Free Dynamics.” *Automatica* 171:111916.
- 2024 [J8] Ochoa, D. E., M. U. Javed, X. Chen, and J. I. Poveda. “Decentralized Concurrent Learning with Momentum and Restart.” *Systems & Control Letters* 192:105931.
- 2024 [J7] Ochoa, D. E., N. Espitia, and J. I. Poveda. “Prescribed-Time Control in Switched Systems with Resets: A Hybrid Dynamical Systems Approach.” *Systems & Control Letters* 193:105910.
- 2023 [J6] Abdelgalil, M., D. E. Ochoa, and J. I. Poveda. “Multi-Time Scale Control and Optimization via Singular Perturbations and Averaging Theory: From ODEs to Hybrid Dynamical Systems.” *Annual Reviews in Control* 56:100926.

- 2023 [J5] Ochoa, D. E., and J. I. Poveda. "Momentum-Based Nash Set Seeking over Networks via Multi-Time Scale Hybrid Dynamic Inclusions." *IEEE Transactions on Automatic Control*.
- 2023 [J4] Ochoa, D. E., F. Galarza-Jimenez, F. Wilches-Bernal, D. Schoenwald, and J. I. Poveda. "Control Systems for Low-Inertia Power Grids: A Survey on Virtual Power Plants." *IEEE Access* 11.
- 2022 [J3] Ochoa, D. E., and J. I. Poveda. "High-Performance Optimal Incentive Seeking for Transactive Control of Traffic Congestion." *European Journal of Control* 68:100696.
- 2021 [J2] Martinez-Piazuelo, J., D. E. Ochoa, N. Quijano, and L. F. Giraldo. "A Multi-Critic Reinforcement Learning Method: An Application to Multi-Tank Water Systems." *IEEE Access* 8.
- 2020 [J1] Ochoa, D. E., J. I. Poveda, C. A. Uribe, and N. Quijano. "Robust Optimization over Networks Using Distributed Restarting of Accelerated Dynamics." *IEEE Control Systems Letters* 5(1).

Peer-reviewed Conference Papers

- 2026 [C16] Ochoa, D. E., P. P. Jirwankar, and R. G. Sanfelice. "Solution Sets of Geometric Hybrid Dynamical Systems: Topological Properties and Existence of Extremal Solutions." 65th IEEE Conference on Decision and Control [To appear].
- 2026 [C15] Jirwankar, P. P., D. E. Ochoa, and R. G. Sanfelice. "Sufficient Conditions for Set Invariance using Multiple Barrier Functions in Geometric Hybrid Dynamical Systems." 65th IEEE Conference on Decision and Control [To appear].
- 2026 [C14] Montenegro, C. A., D. E. Ochoa, and R. G. Sanfelice. "Pointwise Minimum-Norm Control Laws for a Class of Stochastic Hybrid Systems." 65th IEEE Conference on Decision and Control [To appear].
- 2026 [C13] Montenegro, C. A., D. E. Ochoa, and R. G. Sanfelice. "On Input-to-State Stability for a Class of Stochastic Hybrid Systems." 29th ACM International Conference on Hybrid Systems: Computation and Control.
- 2026 [C12] Ochoa, D. E., and R. G. Sanfelice. "Neural Hybrid Equations: Models, Basic Properties, and Approximation Results." American Control Conference.
- 2025 [C11] Ochoa, D. E., and R. G. Sanfelice. "On Non-Euclidean Contraction Theory for Constrained Differential Inclusions." 64th IEEE Conference on Decision and Control.
- 2025 [C10] Jirwankar, P. P., D. E. Ochoa, and R. G. Sanfelice. "Geometric Hybrid Dynamical Systems on Intrinsic Manifolds, Part II: The Invariance Principle." 64th IEEE Conference on Decision and Control.
- 2025 [C9] Zhang, C., R. Talonia, D. E. Ochoa, and J. I. Poveda. "Deep Source-Seekers with Obstacle Avoidance: Adaptive Hybrid Control with Vision Transformers." 7th Conference on Learning for Dynamics and Control.
- 2024 [C8] Ochoa, D. E., and J. I. Poveda. "Dynamic Gains for Asymptotic-Behavior Shaping in Hybrid Dynamic Inclusions." 63rd IEEE Conference on Decision and Control.
- 2024 [C7] Ochoa, D. E., and J. I. Poveda. "Prescribed-Time Concurrent Learning with Switching Datasets." 8th IFAC Conference on Analysis and Design of Hybrid Systems.
- 2023 [C6] Chen, Y., D. E. Ochoa, J. R. Marden, and J. I. Poveda. "High-Order Decentralized Pricing Dynamics for Congestion Games: Harnessing Coordination to Achieve Acceleration." American Control Conference.
- 2022 [C5] Ochoa, D. E., and J. I. Poveda. "Accelerated Continuous-Time Approximate Dynamic Programming via Data-Assisted Hybrid Control." 14th IFAC Workshop on Adaptive and Learning Control Systems.
- 2021 [C4] Ochoa, D. E., J. I. Poveda, A. Subbaraman, G. S. Schmidt, and F. R. Pour-Safaei. "Accelerated Concurrent Learning Algorithms via Data-Driven Hybrid Dynamics and Nonsmooth ODEs." 3rd Conference on Learning for Dynamics and Control, PMLR 144.
- 2021 [C3] Ochoa, D. E., J. I. Poveda, and C. A. Uribe. "Computation-Aware Distributed Optimization over Networks: A Hybrid Dynamical Systems Approach." Workshop on Computation-Aware Algorithmic Design for Cyber-Physical Systems.
- 2019 [C2] Ochoa, D. E., J. I. Poveda, C. A. Uribe, and N. Quijano. "Hybrid Robust Optimal Resource Allocation with Momentum." 58th IEEE Conference on Decision and Control.
- 2019 [C1] Ochoa, D. E., G. Riano-Briceno, N. Quijano, and C. Ocampo-Martinez. "Control of Urban Drainage Systems: Optimal Flow Control and Deep Learning in Action." American Control Conference.

Under Review

- [U1] Jirwankar, P. P., D. E. Ochoa, C. A. Montenegro, and R. G. Sanfelice. "Multiple Control Barrier Functions for Geometric Hybrid Systems: Modeling and Safe Control Synthesis."

In Preparation

- [Pr] Ochoa, D. E., and R. G. Sanfelice. "Time-Varying Hybrid Inclusions with Measurable-in-Time Flow Maps."

[P₂] Ochoa, D. E., and R. G. Sanfelice. “Non-Euclidean Incremental Stability for Constrained Differential Inclusions via One-Sided Lipschitz Conditions.”

[P₃] Jirwankar, P. P., D. E. Ochoa, and R. G. Sanfelice. “Geometric Hybrid Dynamical Systems: Part I – Modeling and Stability.”

SELECTED PRESENTATIONS

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- 2026 “On Structural Knowledge in Learning-Based Modeling of (Hybrid) Dynamical Systems.” SCALE Seminar, University of California, Berkeley.
 - 2026 “Neural Hybrid Equations: Models, Basic Properties, and Approximation Results.” American Control Conference. See [C₁₂].
 - 2026 “On the Instability of Nesterov’s ODE under Non-Conservative Vector Fields.” American Control Conference. See [J₁₀].
 - 2026 “Neural Hybrid Equations: Structure-Preserving Models for Hybrid Systems.” CPSRC Seminar, UC Santa Cruz (extended version); 8th NorCal Control Workshop, CSU Monterey Bay.
 - 2025 “Approximation of Hybrid Dynamical Systems via Neural Hybrid Equations.” Bay Area Robotics Symposium, Stanford University.
 - 2024 “Dynamic Gains for Asymptotic-Behavior Shaping in Hybrid Dynamic Inclusions.” 63rd IEEE Conference on Decision and Control. See [C₈].
 - 2024 “Prescribed-Time Concurrent Learning with Switching Datasets.” 8th IFAC Conference on Analysis and Design of Hybrid Systems. See [C₇].
 - 2023 “High-Order Decentralized Pricing Dynamics for Congestion Games: Harnessing Coordination to Achieve Acceleration.” American Control Conference. See [C₆].
 - 2022 “Model-Free Global Optimization under Topological Obstructions: Exploration and Exploitation via Hybrid Control.” 40th Southern California Control Workshop, Stanford University.
 - 2022 “High-Performance Optimal Incentive Seeking for Transactive Control of Traffic Congestion.” European Control Conference. See [J₃].
 - 2022 “Accelerated Continuous-Time Approximate Dynamic Programming via Data-Assisted Hybrid Control.” 14th IFAC Workshop on Adaptive and Learning Control Systems. See [C₅].
 - 2021 “Accelerated Concurrent Learning Algorithms via Data-Driven Hybrid Dynamics and Nonsmooth ODEs.” 3rd Conference on Learning for Dynamics and Control. See [C₄].
 - 2021 “Computation-Aware Distributed Optimization over Networks: A Hybrid Dynamical Systems Approach.” Workshop on Computation-Aware Algorithmic Design for Cyber-Physical Systems. See [C₃].
 - 2019 “Hybrid Robust Optimal Resource Allocation with Momentum.” 58th IEEE Conference on Decision and Control. See [C₂].

PRIOR RESEARCH EXPERIENCE

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- 2022 – 2024 **Graduate Student Researcher**, University of California, San Diego
 - Designed robust gradient-free dynamics for optimization and online decision-making, combining hybrid dynamical systems with nonlinear control theory.
 - Developed prescribed-time regulation tools for hybrid dynamical systems that converge on a deadline set in advance, independent of the initial condition.
 - Designed hybrid vibrational controllers achieving robust stabilization of nonlinear mechanical systems.
 - Published this work in *Automatica*, *IEEE Transactions on Automatic Control*, and *Systems & Control Letters*.
 - 2019 – 2022 **Graduate Research Assistant**, University of Colorado, Boulder
 - Formulated high-performance optimization and Nash equilibrium seeking algorithms using hybrid dynamical systems theory.
 - Established stability and convergence guarantees that let these dynamics be deployed as feedback controllers.
 - Published seven papers, including in *IEEE Transactions on Automatic Control*, *European Journal of Control*, and *L4DC*.
 - 2017 – 2019 **Graduate Research Assistant**, Universidad de los Andes, Colombia
 - Designed flood-mitigation controllers for water distribution systems, combining reinforcement learning with passivity-based control.
 - Published work at the American Control Conference.

 MENTORING

- 2025 – present **Postdoctoral Mentor**, UC Santa Cruz
- Mentored Ph.D. candidate Piyush P. Jirwankar on geometric hybrid dynamical systems on intrinsic manifolds, co-authoring four papers [C10, C15, U1, P3].
 - Supervised Ph.D. candidate Carlos A. Montenegro on input-to-state stability and minimum-norm control for stochastic hybrid systems, co-authoring two papers [C13, C14].
- 2024 **Mentor**, Enlace Summer Research Program, UC San Diego
- Mentored an undergraduate researcher on machine learning for perception-assisted hybrid obstacle avoidance, co-authoring the resulting paper [C9].
- 2023 – 2024 **Supervisor**, Undergraduate Mechanical Design Team, UC San Diego
- Supervised an undergraduate team in “Fundamental Principles of Mechanical Design” through weekly design reviews.
 - Developed the theory and simulation tools that let the team stabilize a pendulum at its unstable equilibrium using hybrid vibrational control.
 - Wrote course materials and led technical sessions on hybrid control design.
- 2021 **Mentor**, Discovery Learning Apprenticeship Program, University of Colorado, Boulder
- Advised an undergraduate researcher on high transient-performance transactive strategies for data-driven traffic control.

 TEACHING EXPERIENCE

- Spring 2025 **Guest Lecturer**, Hybrid Dynamical Systems, UC Santa Cruz
- Lectured on perturbations of dynamical systems and generalized solutions.
- Spring 2024 **Teaching Assistant**, Probability and Random Processes for Engineers, UC San Diego
- Designed and led 10 discussion sections for 40 students, centered on problem-solving.
 - Wrote solution sets for homework and supplementary problems.
 - Used in-class quizzes to gauge understanding and adjust each session’s pace.
- Fall 2020 **Teaching Assistant**, Discrete Mathematics, University of Colorado, Boulder
- Guided students through implementing Python solvers for Boolean satisfiability problems.
 - Taught an introductory Python tutorial on control flow and data structures.
- Fall 2019 **Teaching Assistant**, Reinforcement Learning and Adaptive Control, University of Colorado, Boulder
- Built computational exercises that made the course’s theoretical results concrete.
- 2017 – 2019 **Laboratory Instructor**, Control Theory Laboratory, Universidad de los Andes, Colombia
- Devised laboratory assessments reinforcing lecture material through hands-on work.
 - Co-created a low-cost aero-pendulum project that let students test classical control techniques on real hardware.

 INSTITUTIONAL and PROFESSIONAL SERVICE

- 2025 – 2026 **Lead Organizer**, 5th and 6th Workshops on Computation-Aware Algorithmic Design for Cyber-Physical Systems, CPS-IoT Week
- Convened two editions of an international workshop on algorithm design for cyber-physical systems under computational constraints, at CPS-IoT Week 2025 (Irvine, CA) and 2026 (Saint-Malo, France), with 13 invited speakers across the two programs.
- 2023 – 2024 **Director of Academic Development**, Latine Graduate Student Association, UC San Diego
- Planned and ran a CV workshop for graduate students.
 - Served on the task force for the Graduate Living and Learning Center initiative.
- 2023 **Organizing Board Member**, Graduate Roadmap Initiative, SHPE, UC San Diego
- Organized a recruitment event promoting graduate education pathways to prospective students, covering venue, scheduling, and budget.
- Referee for:** *Automatica*; *IEEE Transactions on Automatic Control*; *IEEE Transactions on Control Systems Technology*; *IEEE Transactions on Control of Network Systems*; *IEEE Conference on Decision and Control*; *American Control Conference*; *IEEE Control Systems Letters*; *Nonlinear Analysis: Hybrid Systems*.