

Maria G. Mendoza

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EDUCATION

University of California, Berkeley – Ph.D. Mechanical Engineering (3.9/4.0) 2023 - Present
Research Advisor: Prof. Shankar Sastry

Purdue University – M.S. Aeronautics and Astronautics 2021
University of Southern California – B.S. Mechanical Engineering 2017

RESEARCH EXPERIENCE

Graduate Research Assistant, University of California, Berkeley 2023 - Present

- Advised by Prof. Shankar Sastry, I develop algorithms for modeling and controlling **multi-agent systems** through **distributed control, optimization, and game theory** in uncertain and dynamic environments. This includes safety-critical reinforcement learning, distributed trajectory optimization, and market-based coordination mechanisms.
- Research applies to **Advanced Air Mobility (AAM)**, autonomous robotics for **humanitarian assistance**, strategic vehicle path planning, dynamic routing, and safety-enabled multi-agent reinforcement learning (MARL) methods for collision avoidance.

Undergraduate Research, University of Southern California 2017

- Supervised by Prof. Yan Jin at the IMPACT Laboratory, focusing on machine learning prediction algorithms for mechanical design.
- Developed and evaluated algorithms for ship collision avoidance, gaining skills in data analytics, applied mathematics, communication, and technical writing.

Undergraduate Research, Tsinghua University, Beijing, China 2016

- Worked under Prof. Mingguo Zhao in the Robotic Controls Lab.
- Designed and tested mechanical components for passive walking in bipedal robots, studying human locomotion and passive-dynamic mechanisms.

Undergraduate Research, California State University, Northridge 2014

- Assisted with battery material selection, corrosion analysis, and potentiostatic testing in the Materials Lab, supervised by Dr. Reiner and Dr. Bavarian.

PUBLICATIONS

- **M.G. Mendoza**, A. Kalanther, D. Bostwick, E. Stephan, C. Maheshwari, and S. Sastry. “*Coordinated Autonomous Drones for Human-Centered Fire Evacuation in Partially Observable Urban Environments.*” (2025, recently accepted) **IEEE Global Humanitarian Technology Conference (GHTC).**
 - Proposed a novel multi-agent framework where heterogeneous UAVs (high-level and low-level rescuers) coordinate to locate, intercept, and guide panicked evacuees during urban fire scenarios. The system integrates a psychologically grounded agent-based model of human behavior with deep reinforcement learning. Simulation results show that UAV support significantly reduces evacuation times and improves resilience under uncertainty, highlighting the role of autonomous
- Choi, J., Aloor, J., Li, J., **Mendoza, M.G.**, Tomlin, C., Balakrishnan, H. (2025). Resolving Conflicting Constraints in Multi-Agent Reinforcement Learning with Layered Safety. **Robotics**

Science and Systems (RSS) Conference, 2025. (Also available as arXiv preprint arXiv:2505.02293)

- o Developed a layered safety framework for multi-agent reinforcement learning that integrates Control Barrier Functions (CBFs) with deep RL to resolve conflicting safety constraints. The method enforces collision avoidance and constraint satisfaction through control-theoretic safety layers while enabling agents to learn high-performance policies. Demonstrated robust coordination in hardware using Crazyflie drones and simulations for Advanced Air Mobility.
 - **Mendoza, M. G.,** Maheshwari, C., Tuck, V. M., Su, P. Y., Qin, V. L., Seshia, S. A., ... & Sastry, S. (2025). Privacy-Preserving Mechanisms for Coordinating Airspace Usage in Advanced Air Mobility **ACM Journal of Autonomous Transportation Systems**. doi.org/10.1145/3732290
 - o Developed a market-based allocation framework for capacity-constrained urban airspace that ensures fair access for heterogeneous AAM vehicles with private valuations. Introduced an artificial credit system (“air credits”) that enables privacy-preserving, anonymous transactions while achieving competitive equilibrium prices. Leveraged distributed optimization techniques to coordinate trajectory planning across diverse services (e.g., drone delivery, air taxis), balancing system efficiency with fairness and equity.
 - Lockheed Martin Internal Publications (classified, 2017 - 2022)
 - *Reduction of Semi-Truck Aerodynamic Drag.* ” Presented at the **American Institute of Aeronautics and Astronautics (AIAA)** Region VI Student Paper Conference, 2017
 - o Designed and evaluated aerodynamic modifications for semi-trucks using wind tunnel testing and computational fluid dynamics (CFD) validation, demonstrating significant drag reduction and improved fuel efficiency potential.

PRESENTATIONS

- Presentation of Technical Paper “Coordinated Autonomous Drones for Human-Centered Fire Evacuation in Partially Observable Urban Environments” at IEEE Global Humanitarian Technology Conference (2025)
 - **Invited Speaker, Encuentro de Mujeres Latinas en STEM del Área de la Bahía (Symposium hosted by the Chilean Government).**
Talk: “*Un renacer científico en el extranjero: Una travesía entre lo profesional, la readaptación cultural y el proceso de autoconocimiento*” (“A Scientific Rebirth Abroad: A Journey Through Professional Growth, Cultural Readaptation, and Self-Discovery”). September 12, 2024.
 - Presentation of Technical Paper “Reduction of Semi-truck Aerodynamic Drag” at AIAA (2017)

TEACHING EXPERIENCE

Engineering Faculty, Cañada College, San Mateo Community College District 2022-2023

- Developed and taught **Introduction to Engineering** and **Computational Methods for Engineers and Scientists** in a hybrid format.
 - Mentored and advised students on academic and career pathways in engineering.
 - Designed inclusive curriculum materials to support transfer readiness for diverse student populations.

MENTORSHIP AND OUTREACH

Graduate Mentor, UC Berkeley Transfer-to-Excellence (TTE) Research Program Summer 2025

- Designed and supervised independent research projects for two community college students in robotics and AI.
 - Project 1: Modeling human behavior for human–robot interaction.
 - Project 2: Simulating dynamic environments with fire modeling techniques for UAV

disaster relief in Unity physics engine.

- Guided students through the entire research process: from project design to data analysis and poster preparation, culminating in poster presentations at the program's research symposium.

Mentor, Upward Bound (College of the Canyons)

Summer 2015

PROFESSIONAL EXPERIENCE

Research Scientist, Lockheed Martin

2017-2022

- Led multiple AI/ML and robotics research projects, focusing on hypersonic systems, human-drone communication, and mission exploration in constrained environments.
- Managed research with five partner universities on hypersonic technologies and proposed novel aircraft weight prediction methods.
- Performed aerothermal analysis to develop next-gen high-speed vehicle avionics and structure.

LEADERSHIP AND SERVICE

Treasurer, Latino Association of Graduate Students in Engineering and Science (LAGSES), UC Berkeley — 2025

- Manage organizational budget, fundraising, and event planning to support the organization.

Corporate Liaison, LAGSES, UC Berkeley — 2024–2025

- Coordinated partnerships with industry sponsors to support LAGSES activities and needs.

Outreach Chair, SHPE, University of Southern California — 2016

- Organized outreach initiatives to engage K–12 and undergraduate students in STEM.

Chapter Founder and President, Society of Hispanic Professional Engineers (SHPE), College of the Canyons — 2014

- Established the first SHPE chapter at College of the Canyons and served as the first President.

PROFESSIONAL MEMBERSHIPS

- Society of Hispanic Professional Engineers (SHPE)
- Institute of Electrical and Electronics Engineers (IEEE)
- Latino/a Association of Graduate Students in Engineering and Science (UC Berkeley)
- Women in Robotics

HONORS AND AWARDS

- NSF Research Fellowship for Digital Transformation of Development (2024)
- Extraordinary Engineering and Technology Award, Lockheed Martin (2021)
- The Tony Maxworthy Award for combined experimental and analytical excellence (USC, 2017)
- Third Place at the Student Paper Conference at AIAA for a presentation on Semi-truck Aerodynamic Drag Reduction (2017)

SPECIALIZED SKILLS

- **Control & Optimization:** Control theory, game theory, mechanism design, multi-agent systems, distributed optimization, submodular optimization, trajectory planning
- **AI/ML & Data Science:** Deep reinforcement learning, supervised & unsupervised learning, CUDA, TensorFlow, PyTorch, NumPy, Pandas, SciPy, Scikit-learn
- **Programming & Tools:** Python, MATLAB, C++, Linux, Docker, Git, Jupyter Notebook, Google Colab, Anaconda, HTML/CSS
- **Robotics & Simulation:** ROS, Gazebo, Unity, Unreal Engine, AirSim, Isaac Sim, agent-based modeling
- **CAD & Engineering Software:** Siemens NX, SolidWorks, CREO, CATIA V5, STAR CCM+, Thermal Desktop, SINDA, FEMAP
- **Other Technical Expertise:** Aerodynamics & CFD, experimental methods (wind tunnel testing), human-robot interaction, safety-critical system design