Sergio A. Esteban

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Education

California Institute of Technology **Pasadena, CA**
Ph.D., Mechanical Engineering, Robotics—Controls & Dynamics *September 2021—Present*
- Advisor: Dr. Aaron D. Ames

California State Polytechnic University, Pomona **Pomona, CA**
B.S., Mechanical Engineering *September 2016—December 2020*
- Major GPA: 3.95 / 4.00 | Overall GPA: 3.94 / 4.00
- Summa Cum Laude

Research Interests

My research interests lie in robotic locomotion, hybrid dynamical systems, and control theory, with a particular focus on developing model- and learning-based controllers for agile and robust legged locomotion.

Experience

MIT Lincoln Laboratory **Lexington, MA**
Research Fellow (via GEM Fellowship) *June 2021—August 2021*
- Designed and built a low Earth orbit precision 2-DOF gimbal system, including custom design and mechanical fabrication, sensor integration, and full hardware assembly.
- Developed embedded software and a state-space controller for this gimbal achieving micro-radian-level pointing accuracy. This work supported by the GEM Ph.D. Fellowship.

Raytheon Intelligence & Space **El Segundo, CA**
Mechanical Engineer *January 2021—May 2021*
- Designed test and support hardware for space systems, producing detailed engineering drawings for both test fixtures and flight components.
- Automated hardware testing with custom software and supported environmental qualification efforts, including cleanroom test campaigns.

Stanford University, Multi-Robot Systems Lab **Stanford, CA**
Research Fellow, SURF Program *June 2019—August 2019*
- Developed and validated UAV swarm path-planning algorithms in Stanford's MSL Lab, integrating ROS, OptiTrack motion capture, and quadcopter testing for reliable waypoint following in ecological survey missions.
- Conducted UAV swarm survey field experiments and presented results at the Stanford SURF Symposium, earning 2nd place out of 40 for research excellence.

NASA Jet Propulsion Laboratory **Pasadena, CA**
Mechanical and Robotics Engineer Intern *January 2019—June 2019*
- Supported Mars Perseverance Rover mobility system integration, co-led development of a variable–center-of-gravity handling fixture, and led stress testing and subsystem validation with mobility engineers and flight technicians in cleanroom and analog environments.
- Designed a fork-style wheel assembly for the RoboSimian robot to eliminate terrain-snagging issues and enhance its multi-modal locomotion performance.

California Institute of Technology, Amber Lab **Pasadena, CA**
Research Fellow, WAVE Fellows Program *June 2018—August 2018*
- Developed a two-axis UAV-mounted gimbal system, building custom sensor/control PCBs and implementing real-time PD control to stabilize pitch and roll of altimetry sensors during flight.

Search for Extraterrestrial Intelligence (SETI) Institute **Mountain View, CA**
Research Fellow, CAMPARE Program *June 2017—August 2017*
- Assessed the feasibility of atmospheric water extraction on Mars as an on-site resource strategy to support future human exploration on Mars.

Publications

1. B. Werner*, **S. A. Esteban***, M. de Sa, M. H. Cohen, and A. D. Ames, "Halo: Hybrid auto-encoded locomotion with learned latent dynamics, poincaré maps, and regions of attraction," in *Under Review*, 2026

2. A. B. Ghansah, **S. A. Esteban**, and A. D. Ames, "Hierarchical reduced-order model predictive control for robust locomotion on humanoid robots," in *2025 IEEE-RAS 24th International Conference on Humanoid Robots (Humanoids)*. IEEE, 2025, pp. 1–8

3. **S. A. Esteban**, M. H. Cohen, A. B. Ghansah, and A. D. Ames, "A layered control perspective on legged locomotion: Embedding reduced order models via hybrid zero dynamics," in *2025 IEEE Conference on Decision and Control (CDC)*, 2025

4. **S. A. Esteban**, V. Kurtz, A. B. Ghansah, and A. D. Ames, "Reduced-order model guided contact-implicit model predictive control for humanoid locomotion," in *2025 IEEE International Conference on Robotics and Automation (ICRA)*, 2025, pp. 14 735–14 741

5. **S. A. Esteban**, H. D. Lopez, N. Tsuchiya, and P. Mannion, "Low-cost open-architecture experimental platform for dynamic systems and feedback control," in *2021 ASEE Virtual Annual Conference Content Access*, 2021

6. **S. A. Esteban** and P. Lee, "Fog on mars: Potential implications for water extraction from the martian atmosphere," in *49th Lunar and Planetary Science Conference*. Houston: Lunar and Planetary Institute, 2018, p. 2770

Teaching and Mentoring

Caltech MCE Department Big Sib/Little Sib Program **Pasadena, CA**
Big Sib *August 2023—June 2024*

- Mentored a first-year graduate student as part of the department's "Big Sib–Little Sib" program, providing guidance on navigating coursework, research, and the transition into graduate school.

Caltech First-Year Success Research Institute (FSRI) **Pasadena, CA**
Research Mentor *June 2023—September 2023*

- Mentored two first-year undergraduate students through a robotics research project and supported their academic transition by offering guidance on engineering careers, research pathways, and success in undergraduate studies.

FIRST Robotics Competitions (FRC) **Pasadena, CA**
Robotics Team 2404 Mentor *August 2022—March 2024*

- Mentored middle and high school students in designing and building a competition robot for FRC, teaching fabrication, machining, electronics, programming, and engineering design principles, while also providing guidance on preparing for a career in engineering.

Cal Poly Pomona Educational Opportunity Program (EOP) **Pomona, CA**
Tutor *September 2018—December 2018*

- Tutored undergraduate students in college-level math, science, and mechanical engineering courses on a part-time basis while attending school full time.

Cal Poly Pomona Educational Talent Search (ETS) **Pomona, CA**
Peer Mentor *October 2016—June 2017*

- Tutored high school students in mathematics and physical science while providing ongoing academic and professional guidance through regular mentoring.

Cal State San Bernardino Student Mentoring Program (SMP) **San Bernardino, CA**
Student Mentor *September 2015—June 2016*

- Mentored first-year undergraduate students through regular meetings, helping them adjust to college life, explore majors, and develop effective academic habits for long-term success.

Outreach & Community Engagement

Caltech Robotics Outreach **Riverside, CA**

Outreach Volunteer for the Amber Lab *June 2022—Present*

- Led more than two dozen robotics-focused lab tours for middle and high school students, collaborating with Caltech's Center for Teaching, Learning, and Outreach (CTLO), Pasadena-area schools, and programs such as DaVinci Camp, "Noche de Ciencias", and FIRST Robotics to inspire interest in engineering and STEM careers.

Iglesia de Dios en Riverside **Riverside, CA**

Music Instructor *January 2017—December 2023*

- Taught music theory and instrumental technique (piano, guitar, bass, and drums) to adolescent and young adult students at a local church, providing structured instruction that combined music theory with practical skills.

Honors and Awards

GEM Fellowship Program September 2021—June 2026

Ph.D. Engineering Fellow, 5-year sponsorship by MIT Lincoln Laboratory and Caltech.

Stanford University SURF Poster Presentation, 2nd Place August 2019

Award based on poster and oral presentation among 40 other scholars in Stanford's SURF Program.

Louis Stokes Alliances for Minority Participation Math Program June 2016—September 2016

$500 Cash Award

Dean's and President's List September 2016—December 2020

Cal Poly Pomona high GPA distinction.

Technical Skills

Programming: C++, Python, MATLAB, Simulink, LabView

Version Control: Git, CPDM, EPDM, Siemens Teamcenter

Software and Packages: Robot Operating System (ROS), Mujoco, Drake, Isaac Lab, Brax, JAX, PyTorch

CAD: Solidworks, Creo, Siemens NX, Femap Nastran

Operating Systems: Linux (Ubuntu), Windows, macOS

Machine Prototyping: CNC Machining, Vertical Mill, Lathe, Water Jet, Soldering, Welding, Laser Cutting, and 3D Printing

Languages: English and Spanish: Native (Written/Spoken/Interpretation)