MAX J. EMERICK

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SUMMARY

Ph.D. Candidate at UC Santa Barbara and NDSEG Graduate Fellow specializing in dynamical systems, control theory, and applied mathematics. Current research focuses on optimal control of density-based systems, with applications in fluids, stochastics, and swarm robotics. Experienced in research, teaching, industry, and leadership, with recognized achievements across all areas.

EDUCATION

Ph.D. in Mechanical Engineering, University of California Santa Barbara — Sep 2022 – Present
Focus in **Dynamical Systems and Control Theory** — **4.0 GPA**

M.S. in Mechanical Engineering, University of California Santa Barbara — Sep 2020 – Sep 2022
Focus in **Dynamical Systems and Control Theory** — **4.0 GPA**
Thesis: *Control of Continuum Swarm Systems via Optimal Control and Optimal Transport Theory*

B.S. in Mechanical Engineering, California Polytechnic State University — Sep 2015 – Jun 2020
Concentration in **Mechatronics**, Minor in **Mathematics** — **3.9 GPA**
Capstone Project: *Surface Autonomous Vehicle for Emergency Rescue*

HONORS & AWARDS

National Defense Science and Engineering Graduate Fellowship — Sep 2024 – Present

Outstanding Teaching Assistant Award, UCSB Mechanical Engineering Department — May 2025

Outstanding Student Paper Award, 62nd IEEE Conference on Decision and Control — Dec 2023

Best Teaching Assistant Award, UCSB Mechanical Engineering Department — Oct 2023

IFAC Young Author Award, 9th IFAC Conference on Networked Systems — Jul 2022

Graduated Summa Cum Laude, California Polytechnic State University — Jun 2020

Cal Poly Outreach Academic Scholarship — Sep 2015 – Jun 2019

WORK & RESEARCH EXPERIENCE

Graduate Student Researcher, Bamieh Lab, UC Santa Barbara — Apr 2021 – Present

- Conducting fundamental research on mathematical methods for control of distributed systems
- Developed new techniques for control design for various swarm-based, stochastic, and fluid systems
- Published and presented results in peer-reviewed journals and at various international conferences

Graduate Teaching Assistant/Instructor, UC Santa Barbara — Jan 2021 – Dec 2024

- Provided teaching, tutoring, grading support, and hands-on training to students in a variety of courses, including Dynamic Systems Modeling, Vibrations, Controls, Robotics, Mechatronics, Nonlinear Phenomena, and Design for Test Automation
- Developed and taught (as instructor of record) a new TA training course for the UCSB Mechanical Engineering Department

Engineering Intern, Tesla, Fremont, CA — Jun 2021 – Sep 2021

- Worked in manufacturing for the castings team on the pilot line for the “Giga Press”, the largest aluminum die-casting machine in the world
- Took on a wide variety of responsibilities including controls engineering, new station development and testing, line-down recovery, project management, and project coordination

- Improved process and workflow throughout the casting and finishing lines by adding new stations, improving interfaces, and automating and optimizing processes

Student Researcher, Flight Test Data System Lab, Cal Poly Jun 2019 – Sep 2020
- Designed, programmed, and tested embedded systems for taking real-time measurements of boundary layers on aircraft
- Assisted in writing and maintaining C/C++ libraries for numerous devices and applications
- Designed experiments and performed data analysis for device testing and calibration
- Completed three projects, authored four internal reports, and devised new firmware architecture to accelerate the research group's progress

Engineering Intern, Panasonic Avionics Corporation, Bothell, WA Jul 2017 – Aug 2017
- Designed and implemented mounting systems for avionics onboard Boeing 747s and Airbus A330s
- Provided on-site engineering support for system installations and retrofits

Teaching Assistant, Cal Poly Jan 2017 – Mar 2017
- Provided teaching and tutoring support to three sections of Electricity & Magnetism

Private Tutor, Self-Employed Sep 2013 – Jun 2018
- Provided high school and college-level tutoring in mathematics, physics, and engineering

PUBLICATIONS

"Incompressible Optimal Transport and Applications in Fluid Mixing,"
M. Emerick and B. Bamieh, 64th IEEE Conference on Decision and Control. Accepted.

"Optimal Assignment and Motion Control in Two-Class Continuum Swarms,"
M. Emerick, S. Patterson, and B. Bamieh, IEEE Transaction on Control of Network Systems. In review.

"Causal Tracking of Distributions in Wasserstein Space: A Model Predictive Control Scheme,"
M. Emerick, J. Jonas, and B. Bamieh, 63rd IEEE Conference on Decision and Control, pp. 7606-7611, 2024.

"Continuum Swarm Tracking Control: A Geometric Perspective in Wasserstein Space,"
M. Emerick and B. Bamieh, 62nd IEEE Conference on Decision and Control, pp. 1367-1374, 2023.

"Optimal Combined Motion and Assignments with Continuum Models,"
M. Emerick, S. Patterson, and B. Bamieh, *IFAC-PapersOnLine*, vol. 55, no. 13, pp. 121-126, 2022.

CONFERENCE PRESENTATIONS

"Tracking Control in The Wasserstein Space" Jul 2025
Contributed Talk, 2025 SIAM Conference on Control and Its Applications Montreal, Canada

"Causal Tracking of Distributions in Wasserstein Space: A Model Predictive Control Scheme"
Contributed Talk, 63rd IEEE Conference on Decision and Control Dec 2024, Milan, Italy

"Tracking Control in The Wasserstein Space" Nov 2024
Contributed Talk, 44th Southern California Control Workshop Los Angeles, United States

"Optimal Control of Distributions in Wasserstein Space" Aug 2024, Cambridge, United Kingdom
Invited Talk, 26th International Symposium on Mathematical Theory of Networks and Systems

"Continuum Swarm Tracking Control: A Geometric Perspective in Wasserstein Space" Dec 2023
Contributed Talk, 62nd IEEE Conference on Decision and Control Singapore

"Optimal Combined Motion and Assignments with Continuum Models" Jul 2022
Contributed Talk, 9th IFAC Conference on Networked Systems Zurich, Switzerland

CERTIFICATIONS & ASSOCIATIONS

Engineer-in-Training, State of California (#172585) Dec 2020 – Present

Affiliate Member, International Federation of Automatic Control (IFAC) Aug 2022 – Present

Graduate Student Member, IEEE & IEEE Control Systems Society Jul 2022 – Present

Graduate Student Member, Society for Industrial and Applied Mathematics Jul 2022 – Present

LEADERSHIP & INVOLVEMENT

Member, UCSB SIAM Student Chapter Sep 2024 – Present
- Attending and participating in weekly discussions on various topics in applied mathematics

Lead Teaching Assistant (TA), Mech. Eng. Dept., UC Santa Barbara Apr 2023 – Jun 2025
- Selected to serve as Lead TA for over 70 graduate students in Mechanical Engineering
- Developed new TA training and mentorship programs and courses within the department

Founding Board Member/Secretary, UCSB Mech. Eng. Grad. Student Assn. Nov 2023 – Jun 2025
- Helped to organize and set up a new departmental graduate student association
- Took meeting notes, kept records, met with department administration, and helped organize events

STEM Outreach Speaker, Various Nov 2016 – Aug 2022
- Helped organize and deliver STEM workshops at various middle schools in California and Arizona

Member, Cal Poly Simple Group (Undergraduate Math Seminar) Sep 2016 – Mar 2020
- Attended and participated in weekly discussions on various topics in pure and applied mathematics

Member, Cal Poly Bike Builders Club Sep 2017 – Jun 2019
- Helped to design and build custom steel-frame bicycles from the ground up

NCAA Division I Athlete, Cal Poly Men's Swim Team Sep 2015 – Mar 2017
- Competed as a varsity athlete for two seasons for the Cal Poly Men's Swim Team

Volunteer Swim Instructor, Various Sep 2013 – Mar 2017
- Taught swimming at all levels from fundamentals to competition to children of all ages