

Giovanna Amorim

giamorim@princeton.edu | (202) 615 – 3949

EDUCATION

Princeton University

2021 – Present

Ph.D., Mechanical and Aerospace Engineering. Advisor: Naomi Ehrich Leonard

- Expected July 2026

M.A., Mechanical and Aerospace Engineering. Advisor: Naomi Ehrich Leonard *Awarded Mar. 2023*

University of Maryland

2017 – 2021

B.S., Aerospace Engineering

RESEARCH EXPERIENCE

Perceptual Decision-Making

Princeton, NJ

Sep. 2021 – Present

Ph.D. Researcher, Princeton University

Leonard Laboratory. Advisor: Naomi Ehrich Leonard

- Devise a multi-agent opinion dynamics PDE model for decision-making on continuous option spaces (circle and bounded intervals). Analyze consensus, dissensus, and oscillatory spatial pattern formation under external input. Explore applications to ant-inspired collective excavation.
In preparation for IEEE Transactions on Automatic Control, ongoing.
- Develop a two-layer neuromorphic control architecture for autonomous robots monitoring resources in cluttered, dynamic environments with limited sensing, no communication and minimal computation.
In preparation for NPJ Neuromorphic Computing for Parsimonious Autonomous Robots, ongoing.
- Design a decision-making model about a continuous distribution of options on the circle for a single agent. Characterize the model's response to input. Explore applications to robotic navigation in crowded spaces.
Published in IEEE Control Systems Letters 2024, presented at American Control Conference 2025.
- Design a threshold decision-making framework that couples a nonlinear opinion dynamics model to the physical dynamics of an agent that is adaptive to physical constraints and changing environment. Apply this framework to a dynamic task allocation resource collection scenario.
Accepted and presented at European Control Conference 2024.
- Control opinion patterns on signed networks using a nonlinear opinion dynamics model.
Published in IEEE Control Systems Letters 2022.

Walking and Self-Righting Seastar

College Park, MD

Research Assistant, University of Maryland

Sep. 2017 – May 2021

Collective Dynamics and Control Laboratory. Advisor: Derek Paley

- Evolved a seastar's self-righting behavior using HyperNEAT generative encoding.
- Developed seastar models in VoxCAD with material properties that emulate muscles.
- Designed an autonomous soft-robotic starfish platform to operate on land and underwater.
- Devised a closed-loop feedback control system using peristaltic pumps and pressure data.

Self-Driving Vehicle Network Profiles

Pasadena, CA

SURF Researcher, California Institute of Technology

Jun. 2020 – Aug. 2020

Networked Control Systems Group. Advisor: Richard Murray

- Introduced velocity state estimate errors to a simulated network of self-driving vehicles.

- Characterized the robustness of a mathematical framework for guaranteeing safe behavior for a network of self-driving vehicles to state estimate errors.
- Improved the original framework's robustness to imperfect information by altering its profile.

Swarm of Firefighting Drones

Research Assistant, University of Maryland

Unmanned Vehicles Research Laboratory. Advisor: Mumu Xu

- Developed an on-board meta-reasoning policy in Python and ROS for a swarm of drones to select the optimal algorithm to identify and extinguish a fire.
- Validated the meta-reasoning policy simulation results through drone experiments.

PUBLICATIONS

G. Amorim, A. Binyaeva, A. Franci, and N. E. Leonard, "Multi-agent spatially-invariant opinion-dynamics with distributed inputs," in preparation.

H. Sinhmar, **G. Amorim**, V. Srivastava, and N. E. Leonard, "Distributed opinion-driven resource monitoring for minimalist robotic swarm," in preparation.

G. Amorim, A. Binyaeva, A. Franci, and N. E. Leonard, "Spatially-invariant opinion-dynamics on the circle," in *IEEE Control Systems Letters*, vol. 8, pp. 3231-3236, 2024.

G. Amorim, M. Santos, S. Park, A. Franci, and N. E. Leonard, "Threshold decision-making dynamics adaptive to physical constraints and changing environment," in *2024 European Control Conference*, 2024.

A. Binyaeva, **G. Amorim**, M. Santos, A. Franci, N.E. Leonard, "Switching transformations for decentralized control of opinion patterns in signed networks: application to dynamic task allocation," in *IEEE Control Systems Letters*, vol. 6, pp. 3463-3468, 2022.

HONORS AND AWARDS

2024 Eli and Britt Harari Fellowship

Princeton University

2022 Martin Summerfield Memorial Graduate Fellowship

Princeton University

Aerospace Engineering Honors

University of Maryland

2020 Summer Undergraduate Research Fellowship

California Institute of Technology

TEACHING EXPERIENCE

Modern Control

Princeton University, Assistant Instructor

Princeton, NJ

Feb. 2024 – May 2024

- Course on state-space methods for analysis and control of dynamical systems.

Mathematical Methods of Engineering Analysis

Princeton University, Assistant Instructor

Feb. 2023 – May 2023

- Graduate course on topics in complex and functional analysis.

Computer Fundamentals for Engineers

University of Maryland, Teaching Assistant

College Park, MD

Jan. 2018 – May 2021

- Directed software engineering studios where students employ the embedded systems skills they have learned in class.
- Assisted students with the class material during office hours.

Flight Software Systems College Park, MD
University of Maryland, Teaching Assistant Aug. 2019 – Dec. 2020

- Aided the professor with redesigning the course to operate remotely due to COVID-19.
- Designed an autonomous script for grading Python programming assignments.
- Debugged students' code during lab sections and office hours.

Academic Match College Park, MD
University of Maryland, Tutor Jan. 2020 – Dec. 2020

- Tutored a group of four students weekly in dynamics of aerospace systems coursework.

SELECTED TALKS

KU Leuven Rodolphe Sepulchre's Lab 2025
Opinion-Dynamics on Continuous Option Spaces

2025 American Control Conference 2025
Spatially-Invariant Opinion-Dynamics on the Circle

University of Liège Neuroengineering Lab 2024
Perceptual Decision-Making for Dynamic Task Allocation

2024 European Control Conference 2024
Threshold Decision-Making Dynamics Adaptive to Physical Constraints and Changing Environment

University of Liège Neuroengineering Lab 2023
Distributed Control of Opinion Patterns on Mixed Signed Networks

MENTORING

Manali Badwe (Princeton MAE → CMU M.S.)
Emily Yang (Princeton ECE)

TECHNICAL EXPERIENCE

Baja SAE College Park, MD
Terps Racing, Aerodynamics and Brakes Team Lead Sep. 2017 – Sep. 2019

- Designed, built and tested braking system of a baja style vehicle.
- Coordinated the aerodynamics sub-team to design and build body panels that redirected air flow to reduce pressure drag for a baja style vehicle.
- Validated the computational fluid dynamics results with data from coastdown testing and Baja SAE competitions.

Formula SAE College Park, MD
Terps Racing, Team Member Sep. 2018 – Sep. 2019

- Increased the downforce acting on a formula style vehicle in computational fluid dynamics simulations in STAR-CCM+ by designing and adding an engine cover.

SKILLS

Languages: English (Native), Portuguese (Native), French (Advanced)

Programming Languages: Python, C++, Latex

Software: MATLAB, Git, ROS, Simulink, SolidWorks, Fusion360, NX, Cura, Arduino, STK

Operating Systems: Linux, MacOS, Windows

Fabrication: 3D Printing, Soldering, Lathe, Mill, PCB Design