Matthew Romano, PhD

Robotics Researcher

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Education

University of Michigan (UMich) — *Ann Arbor, MI*
PhD in Robotics — *August 2022*

- Dissertation: Planning, Control, and Estimation for Diverse Multi-UAS Missions. Advisor: Ella M. Atkins

MS in Robotics — *May 2019*

University of Illinois Urbana-Champaign (UIUC) — *Champaign, IL*
BS in Electrical Engineering with a Computer Science Minor — *December 2016*

Research Experience

A2Sys Lab, University of Michigan (UMich) — *Ann Arbor, MI*
Graduate Student Researcher — *September 2017 - September 2022*

- Developed an opensource quadrotor and flight controller that integrates reliable, low-latency motion capture feedback
- Derived and experimentally validated a minimum separation bound to guarantee safety in a formation control method
- Developed a novel haptic guidance interface for multilift slung load transportation with real user experiments
- Explored using a team of UAS for wildfire mapping via computationally efficient planning methods in complex 3D terrain
- Added resiliency to a deformable formation via a fluid flow navigation function around pop-up obstacles and vehicle failures
- Researched an autonomous roofing concept via a nailgun-equipped octocopter

Sprite Robotics — *Champaign, IL*
Robotics Firmware Engineer — *January 2017 - May 2017*

- Researched and implemented autonomous navigation strategies for a robotic cat toy platform
- Developed future product ideas including an immersed experience via a 360 degree camera

Bretl Lab, University of Illinois Urbana-Champaign (UIUC) — *Champaign, IL*
Undergraduate Research Assistant — *October 2015 - December 2016*

- Compared performance of monocular simultaneous localization and mapping (SLAM) algorithms.
- Improved feature tracking algorithms through integration of inertial measurement unit (IMU) data.

Research Interests

My research interests include cooperative control, path planning, and higher level autonomy for teams of unmanned aircraft systems (UAS). I have considered diverse missions including formation control for UAS traffic management, multilift slung load transportation, and multi-UAS wildfire detection and mapping. I place importance on the experimental validation of actual systems with real-world considerations.

Journal Publications

1. J. Castagno, M. Romano, P. Kuevor, and E. Atkins, "Multi-unmanned-aerial-vehicle wildfire boundary estimation using a semantic segmentation neural network," Journal of Aerospace Information Systems, pp. 1-19, 2021. `https://doi.org/10.2514/1.I010912`
2. M. Romano, A. Ye, J. Pye, and E. Atkins, "Cooperative Multilift Slung Load Transportation using Haptic Admittance Control Guidance," Journal of Guidance, Control, and Dynamics, 2022. `https://doi.org/10.2514/1.G006587`

Conference Publications

1. M. Romano, P. Kuevor, D. Lukacs, O. Marshall, M. Stevens, H. Rastgoftar, J. Cutler, and E. Atkins, "Experimental evaluation of continuum deformation with a five quadrotor team," in 2019 American Control Conference (ACC). IEEE, Jul 2019. `http://dx.doi.org/10.23919/ACC.2019.8815266`
2. M. Romano, Y. Chen, P. Kuevor, O. Marshall, and E. Atkins, "Nailed it: Autonomous roofing with a nailgun-equipped octocopter," in AIAA AVIATION 2021 FORUM, p. 3211, 2021. `https://doi.org/10.2514/6.2021-3211`
3. M. Romano, H. Uppaluru, H. Rastgoftar, and E. Atkins, "Quadrotor Formation Flying Resilient to Abrupt Vehicle Failures via a Fluid Flow Navigation Function," arXiv preprint arXiv: 2203.01807, 2022 `https://arxiv.org/abs/2203.01807`

4. H. Weiss, A. Patel, M. Romano, B. Apodoca, P. Kuevor, E. Atkins, and L. Stirling, "Methods for Evaluation of Human-in-the-Loop Inspection of a Space Station Mockup Using a Quadcopter," 2022 IEEE Aerospace Conference (AERO), 2022, pp. 1-12. `https://doi.org/10.1109/AERO53065.2022.9843466`.

Teaching Experience

ROB 103: Robotics Mechanisms, University of Michigan (UMich) *Ann Arbor, MI*
Co-Developer & Co-Instructor *Winter 2021*

- Co-Created and co-taught an entire hands-on, freshmen-level, hybrid, Robotics course on short notice (1 month) from scratch
- Successfully modified an existing mobile robot platform to use an A* (Arduino based board) for easier engagement
- Designed, organized, purchased, soldered, and shipped 40 robot kits for in-person and remote students by the 3rd week of class
- Developed and gave half of the technical lecture content (on electronics and programming)
- Developed and wrote half of the lab assignments (electronics, C++ and Python programming, communication)

EECS 592: Foundations of Artificial Intelligence, University of Michigan (UMich) *Ann Arbor, MI*
Graduate Student Instructor *Winter 2020*

- EECS 592 provides a broad introduction to the foundational ideas and techniques of Artificial Intelligence, as well as to develop an appreciation for the engineering issues underlying the design of intelligent computational agents.

Honors & Awards

2019	**AFRL Swarm and Search AI Competition,** First Place Team	*Dayton, OH*
2019	**Into the Dataverse Hackathon,** First Place Team	*Ann Arbor, MI*
2019	**Engineering Research Symposium Scientific Visualization Award,** First Place	*Ann Arbor, MI*
2016	**Lextech Senior Design Most Marketable Project Award,** Recipient	*Champaign, IL*
2016	**Edmund J. James Scholar Distinction,** Recipient	*Champaign, IL*
2016	**Frank C. Mock Scholarship,** Recipient	*Champaign, IL*
2014	**LyondellBasell Futures in the Chemisphere Scholarship,** Recipient	*Champaign, IL*

Service

- Reviewer (AIAA, IEEE)
- Provided tours and flight demonstrations in M-Air (outdoor netted flight facility) and Fly Lab (indoor facility)
- FIRST Tech Challenge (FTC) mentor (2021)
- First Lego League (FLL) mentor (2016)