

# Matthew Romano, PhD

ROBOTICS RESEARCHER

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## Education

### University of Michigan (UMich)

PHD IN ROBOTICS

Ann Arbor, MI

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)

BS IN ELECTRICAL ENGINEERING WITH A COMPUTER SCIENCE MINOR

Champaign, IL

December 2016

## Research Experience

### A2Sys Lab, University of Michigan (UMich)

GRADUATE STUDENT RESEARCHER

Ann Arbor, MI

September 2017 - August 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

ROBOTICS FIRMWARE ENGINEER

Champaign, IL

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

### Brett Lab, University of Illinois Urbana-Champaign (UIUC)

UNDERGRADUATE RESEARCH ASSISTANT

Champaign, IL

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/10.2514/1.1010912>
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

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### **ROB 103: Robotics Mechanisms, University of Michigan (UMich)**

CO-DEVELOPER & CO-INSTRUCTOR

*Ann Arbor, MI*

*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)**

GRADUATE STUDENT INSTRUCTOR

*Ann Arbor, MI*

*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

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

## Service

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- 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)