

EDUCATION	Massachusetts Institute of Technology, Cambridge, MA September 2021 - Present Ph.D. Student, Mechanical Engineering Major in Robotics; Minor in Space Systems Advisor: Prof. Jonathan P. How S.M. in Mechanical Engineering Advisors: Prof. David Trumper and Prof. Kerri Cahoy Awards: Brookfield Design Fellowship, Martin Design Fellowship, NSF GRFP Fellowship Columbia Engineering, New York, NY September 2019 - May 2021 B.S. in Mechanical Engineering Awards: Distinguished Undergraduate Researcher, Dean's Award The College of Idaho, Caldwell, ID September 2016 - May 2019 B.S. in Mathematics and Physics Minors in Spanish and Psychology Awards: Gipson Fellowship, Athletic Scholarship, Dean's Award
PUBLICATIONS	[1] SOS-Match: Segmentation for Open-Set Robust Correspondence Search and Robot Localization in Unstructured Environments. Annika Thomas*, Jouko Kinnari*, Parker C. Lusk, Kota Kondo, Jonathan P. How. <i>International Conference on Intelligent Robots and Systems (IROS)</i>, 2024. [2] PUMA: Fully Decentralized Uncertainty-aware Multiagent Trajectory Planner with Real-time Image Segmentation-based Frame Alignment. Kota Kondo, Claudius T. Tewari, Mason B. Peterson, Annika Thomas, Jouko Kinnari, Andrea Tagliabue, Jonathan P. How. <i>International Conference on Robotics and Automation (ICRA)</i>, 2024. [3] Global Localization in Unstructured Environments Using Semantic Object Maps Built from Various Viewpoints. Jacqueline Ankenbauer, Parker C. Lusk, Annika Thomas, Jonathan P. How <i>International Conference on Intelligent Robots and Systems (IROS)</i>, 2023. Finalist for Best Paper in Safety, Security and Rescue Robotics. [4] Protecting Satellites in Low Earth Orbit: An Overview of Hazards and Policy Solutions. Annika Thomas*, Dansil Green*, Kristen Ammons, Laman Jalil, Joe Kusters, Kerri Cahoy <i>Massachusetts Institute of Technology Science Policy Review</i>, Volume IV, 2023. [5] Innovative Structural and Mechanical Satellite Systems. Annika Thomas. <i>S.M. of Mechanical Engineering at Massachusetts Institute of Technology Thesis</i>, 2023. [6] The AEROS Mission: Characterizing Multi-Spectral Ocean Measurements through Small Satellite Connectivity. Cadence Payne, Pedro Miguel da Silva Pinto, Madeline Loui, Annika Thomas. <i>MIT Portugal Program Conference</i>, 2023. [7] Introducing Experimental Design to Promote Active Learning. Yevgeniy Yesilevskiy, Annika Thomas, Jessica Oehrlein, Melissa Wright, Michael Tarnow. <i>American Society for Engineering Education</i>, 2022.

PUBLICATIONS BEFORE PH.D.	[8] Real-time Estimation of Electron Dynamics in Hall Effect Thrusters using an Extended Kalman Filter. Christine Greve, Annika Thomas, Manoranjan Majji, Kentaro Hara. <i>AIAA Propulsion and Energy Forum</i>, 2020. [9] Real-time Estimation of Low-Temperature Electron Dynamics. Annika Thomas, Christine Greve, Kentaro Hara. <i>Stanford SURF Lightning Talks</i>, 2020. [10] Searching for Evidence of Dark Matter Interaction in Olivine. Annika Thomas, Ethan Brown, Morgan Schaller, Kelly Odgers, M. David Frey. <i>Rensselaer Polytechnic Institute Summer Research Symposium</i>, 2019. [11] Investigating Bubble-Gas Clump Association to Understand the Conditions of Massive Star Formation Annika Thomas, Katie Devine. <i>College of Idaho Student Research Conference</i>, 2019. [12] Magnetomechanics of Magnetic Shape Memory Micropumps. Annika Thomas, Sierra Sandison, Andrew Armstrong, Peter Mullner. <i>Idaho Conference on Undergraduate Research; NSF Research Experience for Undergraduates Symposium</i>, 2018. [13] Harmonics of Hula-Hoop Hypocycloid Motion. Annika Thomas, Zoe Hern, Jim Dull. <i>College of Idaho Student Research Conference</i>, 2018. [14] Imaging M33: Astronomy, Optics, and Electronics. Annika Thomas, Heidi Waterman, Tyler Truksa, Christian Jensen, Natash Dacic, Joe Daglen, Jim Dull. <i>College of Idaho Student Research Conference</i>, 2018. [15] Visually Classifying Yellowballs to Understand their Role in Star Formation. Annika Thomas, Katie Devine. <i>College of Idaho Student Research Conference</i>, 2018. [16] Developing Diagnostics for Sugar Beet Powdery Mildew. Annika Thomas. <i>British Society for Plant Pathology Newsletter</i>, 2018.
PREPRINTS	[17] ROMAN: Open-Set Object Map Alignment for View-Invariant Global Localization. Mason B. Peterson, Yi Xuan Jia, Yulun Tian, Annika Thomas and Jonathan P. How. <i>Arxiv Preprint</i>, 2024.
RESEARCH EXPERIENCE	MIT Aerospace Controls Laboratory May 2023-Present, Cambirdge, MA <i>Ph.D. Student (Supervisor: Jonathan P. How)</i> Worked on global localization in unstructured environments from aerial and ground viewpoints [3], leveraged segmentation and language modeling for mapping and localization in open-set settings [4][17], incorporated uncertainty in multiagent trajectory planning [2]. Currently developing a hierarchical SLAM system leveraging Gaussian Splatting for scene understanding. MIT STAR Laboratory Jun 2022-May 2023, Cambridge, MA <i>S.M. Student (Supervisor: Kerri Cahoy)</i> Led mechanical design, assembly, and integration of BeaverCube2 3U CubeSat, an Earth-observing nanosatellite equipped with onboard AI for task planning, segmenting, and characterizing satellite imagery with machine learning to optimize downlink decisions [5], and analyzed thermal and structural functional requirements of BeaverCube2 and AEROS [5][6].

MIT Precision Motion Control Laboratory Aug 2021-May 2023, Cambridge, MA
S.M. Student (Supervisor: David Trumper)
 Modeled and designed feedback control system for suspension of a novel magnetically-levitated reaction sphere for satellite attitude control [5].

Columbia Engineering Jan 2021-Jan 2022, New York, NY
Research Assistant (Supervisor: Yevgeniy Yesilevskiy)
 Redesigned the mechanical engineering lab course, MECE E3018, at Columbia University to promote active learning [7].

Stanford Plasma Dynamics Modeling Laboratory May-Sep 2020, Palo Alto, CA
Visiting Researcher (Supervisor: Kentaro Hara)
 Predicted plasma flow in spacecraft propulsion systems using extended Kalman filtering [8][9].

Rensselaer Polytechnic Institute Brown Research Group May-Oct 2019, Troy, NY
Visiting Researcher, NSF REU (Supervisors: Ethan Brown and Morgan Schaller)
 Designed an indirect detection technique for weakly interacting massive particle dark matter [10].

Boise State University Magnetic Materials Laboratory May-Jul 2018, Boise, ID
Visiting Researcher, NSF REU (Supervisor: Peter Mullner)
 Designed using SolidWorks and machined biomechanical micropumps, including characterization tests and a user interface to control flow rate [12].

College of Idaho Star Formation Research Lab Feb-May 2019, Caldwell, ID
Independent Study (Supervisor: Katie Devine)
 Visually classified Yellowballs to refine their radius measurements and performed statistical analysis of regression [15].

College of Idaho Observational Astronomy Dec 2017-May 2018, Mayhill, NM; Caldwell, ID
Independent Study and Field Work (Supervisors: Joe Daglen and Jim Dull)
 Collected and analyzed exoplanet data and performed spectroscopy, operated telescopes, imaged M33 galaxy [14].

INDUSTRY **MIT Lincoln Laboratory, Group 76** May-Aug 2022, Lexington, MA
 EXPERIENCE *Engineering Intern, Control and Autonomous Systems*
 Implemented object detection, obstacle avoidance and trajectory planning algorithms for autonomous vehicles, developed a state space model of an inverted double pendulum.

AWARDS

Best in Theme, Long Duration Mars Simulation at the Moon , NASA RASC-AL	2024
Finalist, Best Paper in Safety, Security and Rescue Robotics , IROS [3]	2023
GRFP Fellowship , National Science Foundation	2023
Outstanding GRA , MIT Fraternities, Sororities and Independent Living Groups	2023
Selected from over 100 graduate residential assistants for service to the community	
Martin Fellowship for Design , MIT	2022
Brookfield Fellowship , MIT	2021
Distinguished Tutor , Columbia Tutoring and Learning Center	2021
Developed teaching materials to support students from low-income backgrounds	
John K. Mladinov Scholarship , Columbia Named Scholarships	2020; 2021
U.S. Bank Academic All-Conference Award , Cascade Collegiate Conference	2017-2019
Selected for service and academic excellence while captain of Varsity Women's Golf	
Math and Physical Sciences Department Scholarship , College of Idaho	2017
Awarded to an outstanding student in the MAPS department	
Presidential Merit Scholarship , College of Idaho	2016-2019

TEACHING AND LEADERSHIP EXPERIENCE	Research Mentor , Polygence	Feb 2022 - Present
	Providing mentorship for students to pursue independently led research projects related to robotics, Lunar architecture, machine learning and aircraft/spacecraft design.	
	Invited Lecturer , MIT First Year Graduate Seminar	Sep 2024
	Teaching Assistant: Stochastics; Product Design (Qualifying Exams) , MIT	Sep 2023-Jan 2024
	Invited Speaker, Women in Engineering Showcase , MIT	Aug 2023
	Presented on segmentation for robotic mapping and localization in extreme environments	
	Instructor, Beaver Works Summer Institute , MIT	June 2023
	Instructor, MIT Women's Technology Program , MIT	June 2023
	Instructor, Summer High School Program for Engineers , Columbia	May-Aug 2021
	Taught advanced robotics and multivariable calculus to 30 students	
SERVICE & EXTRA-CURRICULARS	NASA Lunar Autonomy Challenge , MIT Team Lead	Sep 2024-Present
	Leading a team of 12 students to perform surface mapping, autonomous robotic operation, localization, orientation, path planning, and object detection on the Lunar surface using IPEX	
	MIT AeroAstro Communication Lab , Fellow	May 2024-Present
	Provide one-on-one support to undergraduate and graduate students at MIT for journal papers, conference presentations, lab reports, research posters, theses, and job applications.	
	MIT Housing & Residential Services , Graduate Residential Assistant	Aug 2023-Present
	NASA RASC-AL Lunar Mars Analog , MIT Operations Lead	Aug 2023-May 2024
	Led integration of multi-agent robotics and AI into architecture for autonomous operations	
	MIT Graduate Student Council , Volunteer	Aug 2021-Present
	MIT Graduate Association of Mechanical Engineers , Volunteer	Aug 2021-Present
	Reviewer: IEEE Robotics and Automation Letters (RA-L)	2024
	Reviewer: IEEE International Conference on Robotics and Automation (ICRA)	2023; 2024
	Invited Panelist, Mechanical Engineering Graduate Seminar , MIT	Oct 2023
PRESS & MEDIA	Invited Panelist, Beaver Works Summer Institute , MIT	June 2023
	Designing for Outer Space (MIT News)	2024
	AEROS CubeSat Launches to Study Ocean Health (MIT Aero/Astro)	2024
	AEROS CubeSat Mission presented at MIT Portugal Program (MIT Aero/Astro)	2023
	Living the Life I Used to Dream About (Featured at TechGirlz Conference)	2022
	2022 - Year in Review (College of Idaho Annual Scholarship Gala)	2022
	Prestigious Graduate Schools Await Recent Alumni (College of Idaho Newsletter)	2021
	A Laboratory Fit for Lockdown (Columbia Magazine)	2021
	Program alumna pays it forward by helping new students learn to SURF (Stanford)	2021
	Annika Thomas Works on Plasma Engines for Space Propulsion (Stanford)	2020
SELECTED INVITED TALKS	Finding the Way: The Thomas Tutors (College of Idaho Magazine)	2018
	MIT Perception and Localization Seminar: Open-Set Object-Based Localization	Oct 2024
	John F. Kennedy High School: Computer Vision in Astronomy	Oct 2024
	TEDxBoston: Robotics and Regolith: Building Habitats from Moon Dust	July 2024
	MIT Media Lab (Roxbury Latin): Vision in Space	June 2024
	TEDxMIT: Collaborative Vision Systems for Space Exploration	Apr 2024
	Universidad del Valle de Guatemala Women in Engineering Program	
SKILLS	From Pathology to Path Planning: Exploring New Frontiers in Robotics	Apr 2024
	Languages English (<i>native</i>), Spanish (<i>advanced</i>)	
	Programming Python, PyTorch, C/C++, ROS, Java, Matlab, R Studio, Mathematica, HTML	
	Technical Expertise Computer Vision, SLAM, Localization, Pose Estimation, 3D Geometry, Tracking, Neural Rendering, Reconstruction, Linear Algebra, Optimization, Deep Learning	