Annika Thomas

E-mail: annikat@mit.edu
Web: annika-thomas.github.io

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA — September 2021 - Present
Ph.D. Candidate, Mechanical Engineering
Major in Robotics; Minor in Probability and Statistics
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] CU-Multi: A Dataset for Multi-Robot Collaborative Perception.
Doncey Albin, Daniel McGann, Miles Mena, **Annika Thomas**, Harel Biggie, Xuefei Sun, Dusty Woods, Steve McGuire, Jonathan P. How, Christoffer Heckman *International Conference on Robotics and Automation (ICRA)*, 2026.

[2] Terrain-Aware Low-Altitude Path Planning.
Yixuan Jia, Andrea Tagliabue, **Annika Thomas**, Navid Dadkhah Tehrani, Jonathan How. *IEEE Aerospace*, 2026.

[3] LunarLoc: Robust Global Localization for Autonomous Surface Operations on the Moon.
Annika Thomas, Aleksander Garbuz, Trevor Johst, Keerthana Srinivasan, Dami Thomas, Cormac O'Neill, Robaire Galliath, George Lordos, Jonathan How. *IEEE Aerospace*, 2026.

[4] VISTA: Monocular Segmentation-Based Mapping for Appearance and View-Invariant Global Localization.
Hannah Shafferman, **Annika Thomas**, Jouko Kinnari, Michael Ricard, Jose Nino, Jonathan P. How. *Robotics and Automation Letters*, 2026.

[5] GRAND-SLAM: Local Optimization for Globally Consistent Large-Scale Multi-Agent Gaussian SLAM.
Annika Thomas, Aneesa Sonawalla, Alex Rose, Jonathan P How. *Robotics and Automation Letters*, 2025.

[6] 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. *Robotics: Science and Systems*, 2025.

[7] Moon BRICCSS: Moon Blocks using Regolith ISRU for Corbelled Construction of Sustainable Shielding.
Lanie McKinney, Palak B Patel, Daniel Massimino, **Annika Thomas**, Juan Salazar, Mikita Klimenka, George Lordos, Cody Paige, Skylar Tibbits, Dava Newman. *IEEE Aerospace Conference*, 2025.

[8] MARTEMIS: Mars Architecture Research Using Taguchi Experiments on the Moon with International Solidarity.
Lanie McKinney, Palak B. Patel, Mollie Johnson, **Annika Thomas**, et al. *International Astronautical Congress*, 2024.

[9] 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. *International Conference on Intelligent Robots and Systems (IROS)*, 2024.

[10] 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. *International Conference on Robotics and Automation (ICRA)*, 2024.

[11] Global Localization in Unstructured Environments Using Semantic Object Maps Built from Various Viewpoints.
Jacqueline Ankenbauer, Parker C. Lusk, **Annika Thomas**, Jonathan P. How. *International Conference on Intelligent Robots and Systems (IROS)*, 2023.
Finalist for Best Paper in Safety, Security and Rescue Robotics.

[12] 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. *Massachusetts Institute of Technology Science Policy Review*, Volume IV, 2023.

[13] Innovative Structural and Mechanical Satellite Systems.
Annika Thomas. *S.M. of Mechanical Engineering at Massachusetts Institute of Technology Thesis*, 2023.

[14] Introducing Experimental Design to Promote Active Learning.
Yevgeniy Yesilevskiy, **Annika Thomas**, Jessica Oehrlein, Melissa Wright, Michael Tarnow. *American Society for Engineering Education*, 2022.

Conference Presentations

[15] LunarLoc: Segment-Based Global Localization on the Moon.
Annika Thomas, Robaire Galliath, Aleksander Garbuz, Luke Anger, Cormac O'Neill, Trevor Johst, Dami Thomas, George Lordos, Jonathan P. How. *Robotics: Science and Systems Workshop on Resilient Off-road Autonomous Robotics*, 2025.

[16] CU-Multi: A Dataset for Multi-Robot Data Association.
Doncey Albin, Miles Mena, **Annika Thomas**, Harel Biggie, Xuefei Sun, Dusty Woods, Steve McGuire, Christoffer Heckman. *International Conference on Robotics and Automation Workshop on Field Robotics*, 2025.

[17] ROMAN: Robust Object Map Alignment Anywhere.
Mason Peterson, Yi Xuan Jia, Yulun Tian, **Annika Thomas**, Jonathan P. How. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) Workshop on Long-Term Perception*, 2024.

[18] Moon Blocks Using Regolith ISRU for Construction of Sustainable Settlements.
Annika Thomas, Daniel Massimino, Juan Hurtado Salazar, Lanie McKinney, Mikita Klimenka, Palak Patel, Cody Paige, Skylar Tibbets, Nicholar De Monchaux, Jeffrey Hoffman, and Ed Crawley. *International Atronautical Congress (IAC) 6th Space Architecture Symposium*, 2024.

[19] The AEROS Mission: Characterizing Multi-Spectral Ocean Measurements through Small Satellite Connectivity.
Cadence Payne, Pedro Miguel da Silva Pinto, Madeline Loui, **Annika Thomas**. *MIT Portugal Program Conference*, 2023.

Publications Before Ph.D.

[20] Real-time Estimation of Electron Dynamics in Hall Effect Thrusters using an Extended Kalman Filter.
Christine Greve, **Annika Thomas**, Manoranjan Majji, Kentaro Hara. *AIAA Propulsion and Energy Forum*, 2020.

[21] Searching for Evidence of Dark Matter Interaction in Olivine.
Annika Thomas, Ethan Brown, Morgan Schaller, Kelly Odgers, M. David Frey. *Rensselaer Polytechnic Institute Summer Research Symposium*, 2019.

[22] Investigating Bubble-Gas Clump Association to Understand the Conditions of Massive Star Formation
Annika Thomas, Katie Devine. *College of Idaho Student Research Conference*, 2019.

[23] Magnetomechanics of Magnetic Shape Memory Micropumps.
Annika Thomas, Sierra Sandison, Andrew Armstrong, Peter Mullner. *Idaho Conference on Undergraduate Research; NSF Research Experience for Undergraduates Symposium*, 2018.

[24] Imaging M33: Astronomy, Optics, and Electronics.
Annika Thomas, Heidi Waterman, Tyler Truksa, Christian Jensen, Natash Dacic, Joe Daglen, Jim Dull. *College of Idaho Student Research Conference*, 2018.

[25] Developing Diagnostics for Sugar Beet Powdery Mildew.
Annika Thomas. *British Society for Plant Pathology Newsletter*, 2018.

Research Experience

MIT Aerospace Controls Laboratory May 2023-Present, Cambridge, MA
Ph.D. Student (Supervisor: Jonathan P. How)
Worked on global localization in unstructured planetary environments from aerial and ground viewpoints [11][15][3], leveraged segmentation and language modeling for open-set mapping and localization [12][6][4], incorporated uncertainty in multiagent trajectory planning [10]. Developed a large-scale multi-agent Gaussian Splatting SLAM system [5].

MIT STAR Laboratory Jun 2022-May 2023, Cambridge, MA
S.M. Student (Supervisor: Kerri Cahoy)
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 [13], and analyzed thermal and structural functional requirements of BeaverCube2 and AEROS [13][19].

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 [13].

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 [14].

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 [20].

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 [21].

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 [23].

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.

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 specroscopy, operated telescopes, imaged M33 galaxy [24].

Industry Experience

MIT Lincoln Laboratory, Group 76 May-Aug 2022, Lexington, MA
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

Admiral de Flores Prize for Outstanding Ingenuity and Creative Judgment, MIT 2025
Finalist, PhD Communication Competition, Amazon Robotics 2025
Outstanding GRA, MIT Fraternaties, Sororities and Independent Living Groups 2023; 2025
Selected from over 100 graduate residential assitants for service to the community
Best Lightning Talk, MIT SpaceTech Conference 2025
James Means Memorial Award for Excellence in Space Systems Engineering, MIT 2025
Second Place in Lunar Autonomy Challenge, NASA, Johns Hopkins APL 2025
Second Place at Research Slam, MIT AI Conference 2024
Best in Theme, Long Duration Mars Simulation at the Moon, NASA RASC-AL 2024
Finalist, Best Paper in Safety, Security and Rescue Robotics, IROS [11] 2023
GRFP Fellowship, National Science Foundation 2023
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 & 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.
Instructor, MIT OpenCourseWare Nov 2025 - Present
Instructor for The Engineering Student's Guide to Effective Technical Communication
Invited Lecturer, MIT First Year Graduate Seminar Sep 2024; Nov 2025
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 Lunabotics Challenge, MIT Team Advisor — Sep 2024-Present

Election Committee Member, IEEE Chapter CH06349 — Sep 2025-Present

Invited Panelist, Young Professional Workshop, IEEE Rising Stars Conference — Jan 2026

Panel Moderator, Space Tech, Imagination in Action Davos — Jan 2026

Invited Panelist, Physical AI and Robotics Panel, Imagination in Action — Apr 2025

NASA Lunar Autonomy Challenge, MIT Team Lead — Sep 2024-May 2025

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; 2025

Reviewer: IEEE International Conference on Robotics and Autonmation (ICRA) — 2023-2025

Invited Panelist, Mechanical Engineering Graduate Seminar, MIT — Oct 2023

Invited Panelist, Beaver Works Summer Institute, MIT — June 2023

Press & Media

Beyond Computer Vision, Brains In Jars, And How They See (Forbes) — 2025

MIT MAPLE team takes second place in Lunar Autonomy Challenge (MIT Aero/Astro) — 2025

AeroAstro SpaceTech 2025: From the Earth to the Moon (MIT Aero/Astro) — 2025

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

Finding the Way: The Thomas Tutors (College of Idaho Magazine) — 2018

Selected Invited Talks

MIT Media Lab Immersion @Tokyo: World Models We Can Share — Dec 2025

Bangkok AI & Robotics Hackathon and Competitions 2025 Keynote: Building Collaborative Robotics with Gaussian Splatting — Dec 2025

Blue Origin Invited Talk: MIT Autonomous Pathfinding for lunar Exploration — Sep 2025

Amazon Robotics Science Hub Symposium: Adaptive Environment Representations for Collaborative Perception and Localization — Oct 2025

MIT Media Lab (Roxbury Latin): Perception and Localization for Lunar Exploration — May 2025

MIT SpaceTech: Rovers, Rocks, and Reasoning: AI on the Lunar Surface — Apr 2025

Imagination in Action IEEE Technical Talk: Building Collaborative Spatial Intelligence for Multi-Agent Robots — Apr 2025

Imagination in Action Forbes Lightning Talk: Enabling Multi-Agent Robots with Collaborative Visual Intelligence — Apr 2025

AirLab at Carnegie Mellon University Robotics Institute: Graph-Theoretic Object-Based Localization in GPS-Denied Environments — Feb 2025

Women Innovators SheTech Conference: Kenote Address — Jan 2025

MIT AI Conference: Spatial AI for Collaborative Robotics — Oct 2024

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
From Pathology to Path Planning: Exploring New Frontiers in Robotics — Apr 2024

SKILLS

Languages English (native), Spanish (advanced)
Programming Python, C/C++, PyTorch, ROS(1/2), CUDA, Java, MATLAB, R, Mathematica, HTML
Software & Tools Linux, Git, Docker, LaTeX, LabVIEW, Simulink, ANSYS, Thermal Desktop, SolidWorks, Fusion 360, Arduino, Raspberry Pi
Mechanical & Laboratory Skills Milling, Lathe, Laser Cutting, 3D Printing, 3D Scanning, SEM, TEM, XRD, VSM, General Prototyping
Technical Expertise Computer Vision, SLAM, Multi-Agent SLAM, Localization, Pose Estimation, 3D Geometry, Mapping & Reconstruction, Gaussian Splatting, Neural Rendering, Optimization, Deep Learning, Probabilistic Modeling