

Alex Meredith

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EDUCATION

Massachusetts Institute of Technology Cambridge, MA
PhD in Space Systems Engineering (GPA: 5.0/5.0) February 2023 – present

Massachusetts Institute of Technology Cambridge, MA
Master's of Science in Aerospace Engineering (GPA: 5.0/5.0) June 2021 – February 2023

Thesis: Applying Rotation-Equivariant Deep Learning to Cloud and Road Segmentation in Satellite and Aerial Imagery

Massachusetts Institute of Technology Cambridge, MA
Bachelor's of Science in Aerospace Engineering (GPA: 5.0/5.0) August 2017 – June 2021

FELLOWSHIPS & AWARDS

- Draper Fellowship (2023)
- 2nd place, Frank J. Redd Student Competition at the Small Satellite Conference (2023)
- National Science Foundation Graduate Research Fellowship (2022)
- NASA Space Technology Graduate Research Opportunities fellowship (declined) (2022)
- Best presentation award at IEEE RSDM-GeoSci workshop (2022)
- 2022 AIAA Small Satellite Best Paper Award (2022)
- Henry Webb Salisbury Award for superior academic performance (2021)
- Wings Club Foundation Scholarship (2020)
- Intercollegiate Rowing Association All-Academic Team (2019)
- Rewriting the Code Fellow (2018)
- National Merit Scholar (2017)

PUBLICATIONS

Meredith, Alex. “Evaluating Rotation-Equivariant Deep Learning Models for On-Orbit Cloud Segmentation”, in 37th Annual Small Satellites Conference, Logan, 2023 - **received 2nd place in Frank J. Redd student paper competition.**

Meredith, Alex., Leroy, Stephen., Halperin, Lucy., & Cahoy, Kerri (2023). “Efficient Collocation of GNSS Radio Occultation Soundings with Passive Nadir Microwave Soundings.” *Atmospheric Measurement Techniques*.

McKeen, Patrick., **Meredith, Alex.**, and Cahoy, Kerri., “Trajectory-Planning Attitude Control System for Satellites with Magnetic Attitude Control and One Reaction Wheel,” AAS/AIAA Astrodynamics Specialist Conference, Charlotte, North Carolina, August 7-10, 2022.

Kacker, Shreeyam., **Meredith, Alex.**, Cahoy, Kerri., & Labrèche, Georges. “Machine Learning Image Processing Algorithms Onboard OPS-SAT”, in 36th Annual Small Satellites Conference, Logan, 2022.

Kacker, Shreeyam., **Meredith, Alex.**, Kusters, Joe., Tomio, Hannah., Felt, Violet., & Cahoy, Kerri. “On-orbit rule-based and deep learning image segmentation strategies”, in AIAA SCITECH 2022 Forum, p. 0646. 2022 –

received **2022 AIAA Small Satellite best paper award**.

do Vale Pereira, Paula., Garcia, Madeline., Schroeder, Madeleine., Caldelas, Humberto., Lindsay, Charles., Choi, Alex., Pfrang, Kaila., Gagnon, Amelia., **Meredith, Alex.**, ... & Cahoy, Kerri. “BeaverCube: Coastal Imaging with VIS/LWIR CubeSats”, in 34th Annual Small Satellites Conference, Logan, 2020.

CONFERENCE PRESENTATIONS

Meredith, Alex. “Evaluating Rotation-Equivariant Deep Learning Models for On-Orbit Cloud Segmentation”, at 37th Annual Small Satellites Conference, Logan, 2023 - **received 2nd place in Frank J. Redd student paper competition**.

Meredith, Alex., Leroy, Stephen., and Cahoy, Kerri. “Rotation Method for Efficient Collocation-Finding”, at IEEE GRSS workshop on Remote Sensing Data Management Technologies in GeoScience 2022 (presented solo) – **received 2022 IEEE RSDM-GeoSci best presentation award**.

Kacker, Shreeyam., **Meredith, Alex.**, Kusters, Joe., Tomio, Hannah., Felt, Violet., & Cahoy, Kerri. “On-orbit rule-based and deep learning image segmentation strategies”, at AIAA SCITECH Forum 2022 (co-presented with Shreeyam Kacker).

OUTREACH PRESENTATIONS

Garcia, Madeline., Green, Dansil., and **Meredith, Alex.** “How to Build a Space Mission”, to a middle-school audience visiting MIT for Spark 2023.

Meredith, Alex. “Pursuing graduate research in engineering as a woman”, to BIO3898 (Women in Science), Department of Biology, Seattle Pacific University, 2022 (updated from 2021 presentation).

Meredith, Alex. “Pursuing graduate research in engineering as a woman”, to BIO3898 (Women in Science), Department of Biology, Seattle Pacific University, 2021.

RESEARCH EXPERIENCE

MIT Aerospace Controls Lab

Graduate Research Assistant

Cambridge, MA

October 2023 – present

- Developing robust, adaptive guidance algorithms for aerocapture at Uranus

MIT STARLab

Graduate Research Assistant

Cambridge, MA

June 2021 – October 2023

- Developed fast algorithms that exploit orbital symmetry for colocating satellite data from microwave soundings and radio occultations
- Designed convolutional neural networks (CNNs) to identify clouds in satellite images from visible-spectrum and long-wave infrared cameras
- Optimized planning and trajectory optimization algorithms for underactuated CubeSats using magnetorquer-only control

MIT STARLab

Undergraduate Researcher

Cambridge, MA

June 2020 – June 2021

- Designed and wrote Extended Kalman Filter for CubeSat attitude determination in MATLAB
- Developed physics-based sandbox environment for testing attitude determination and control algorithms using Simulink
- Worked on extending existing magnetorquer-only control algorithms to handle predictable disturbance torques from the space environment and uneven thrust from CubeSat propulsion systems

WORK EXPERIENCE

E-Space

Control Systems Engineering Intern

Beverly, MA

June 2021 – August 2021

- Developed Python simulation modeling orbital environment, disturbance torques, actuators, and attitude determination sensors to design & evaluate magnetorquer-only (underactuated) attitude control system
- Wrote, tested and speed-optimized nonlinear optimization algorithm for planning underactuated slews in C++
- Presented my work on E-Space's attitude control system to VCs who later invested \$50M in the company

Analytical Graphics, Inc.

Engineering Intern

Exton, PA

June 2020 – August 2020

- Designed CubeSat power system, attitude control system, and optical communications payload and modeled these subsystems using Systems Tool Kit (STK) and STK partner products
- Worked with two other interns to design a CubeSat communications constellation for disaster-relief workers and modeled it in STK
- Completed STK Grandmaster Certification & STK Master Integration Certification

Microsoft

Software Engineering Intern

Redmond, WA

June 2019 – August 2019

- Web-scraped Twitter and did machine learning on datasets of scraped tweets to identify cybersecurity threats in real-time using Python and TensorFlow
- Designed and implemented an internal website using .NET framework to display tweets representing cyberthreat and other cybersecurity-related data in an easy-to-use interface

Explorer Intern

June 2018 – August 2018

- Worked with two other interns to design and implement a data monitoring dashboard in PowerBI, using full Azure stack

SKILLS

Programming Languages: Python, Rust, MATLAB, C++, Java, C, Haskell, JavaScript, HTML/CSS, SQL, Assembly (RISC-V)

Software & Frameworks: STK, ODTK, Keras, Tensorflow, Microsoft Office, Azure, Visual Studio, and PowerBI; BlueSpec