# Caleb Ashmore Adams *Space Systems, Computation, Science*

Curriculum Vitae

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google scholar
my github

## Education

University of Georgia — Athens, GA
**Master's of Science in Computer Science** *2020*

University of Georgia — Athens, GA
**Bachelor's of Science in Computer Science** *2018*

## Experience

NASA Ames Research Center, National Aeronautics and Space Administration — Mountain View, CA

**Project Manager, Distributed Spacecraft Autonomy (DSA)** *July '20 – present*

The DSA project will advance command and control methodologies for controlling a swarm of spacecraft as a single entity, demonstrate autonomous coordination between multiple spacecraft in the swarm, and demonstrate approaches for adaptive reconfiguration of the swarm's plan and distributed decision-making across a swarm of spacecraft. DSA has performed several on-orbit tests to date and will fly as a payload onboard NASA's Starling 1.0 swarm mission. I started as a flight software developer and am now the project manager. Some of my responsibilities include: Project Management, Contractor Management, Agile and Scrum Planning, Requirements Definition, Cost Analysis, Trade Studies, Spacecraft Testing and Integration, Operation of Spacecraft, Flight Software Development, Hardware Integration, and Systems Component Design.

**Principal Investigator, Neural Radiance Methods** *October '22 – present*

The Neural Radiance Methods research project seeks to study potential improvements to traditional photogrammetric methods used to generate Digital Elevation Models of planetary surfaces by utilizing Neural Radiance Fields. Some of my responsibilities include: Project Management, Cost Analysis, Trade and Research Studies, Testing and Integration, Development of Payload Requirements, Aerospace Simulation, and Experiment Design.

**Subtopic Manager, Neuromrophic Computing** *June '22 – present*

Assiting with and managing SBIR and STTR solicitations regarding Neuromrophic computing, processing, and manufacturing. Some of my responsibilities include: Program Management, Technical Research, and Peer Review.

**Autonomous Systems Perception for Urban Air Mobility** *July '20 – July '21*

Developing Computer Vision algorithms using new technologies for object detection, tracking, autonomous decision making, and 3D reconstruction. Some of my responsibilities included: Modeling of Aeronautical Systems, Computer Vision Research, and Software Design.

University of Georgia Small Satellite Research Laboratory — Athens, GA

**Thesis: High Performance Computation with Small Satellites and Small Satellite Swarms for 3D Reconstruction** *January '18 – May 2020*

Here I focus on the design and usage of computer systems in small satellites. The custom computer vision library SSRLCV is developed. The Nvidia TX2i GPU accelerated SoC is modified for use in a Cube Satellite. Results show accurate 3D reconstruction of the surface of Earth feasible within 15 to 100 meters.

**Co-Founder, Program Manager, Systems Engineer** *January '16 – May 2020*

The University of Georgia Small Satellite Research Laboratory (UGA SSRL) was founded when I decided to form a team to build a small 1U cube satellite. The UGA SSRL now includes over 40 undergraduate researchers, 5 graduate students, several faculty researchers, a space act agreement with NASA Ames, a partnership with the Air Force Research Laboratory (AFRL), and more.

**6U CubeSat - MOCI** *January '16 – present*

The Multiview Onboard Computational Imager (MOCI) is a 6U cube satellite funded by the Air Force Research Laboratory's (AFRL) University Program (UNP) NS-9. The MOCI satellite shall use advanced computer vision algorithms and specialized computational hardware, based off of the Nvidia TX2i GPU/SoC, to generate 3D digital surface models of the earth in real time.

**3U CubeSat - SPOC** *January '16 – present*

The Spectral Ocean Color (SPOC) satellite is a 3U cube satellite funded by NASA's Undergraduate Student Instrument Project (USIP) and was selected for NASA's Cube Satellite Launch Initiative (CSLI) for a handoff in Q4 of 2019. The SPOC satellite shall use a custom hyperspectral sensor to analyze the coastal ecosystems of the Georgia coast.

NASA Johnson Space Center, National Aeronautics and Space Administration — Houston, TX

**Core Flight Software Programmer** *April '15 – August '15*

I helped develop Core Flight Software (CFS) to handle audio telemetry and communication for the Orion spacecraft in a simulated lab setting. I also worked in an audio lab with embedded systems for audio equipment.

**Human Systems Integration** *April '15 – August '15*

While working in the Human Integrated Vehicles and Environments (HIVE) Lab I assisted with internal telemetry systems and general networking systems throughout Johnson Space Center. These systems were needed for future Graphic User Interfaces (GUIs) used while training astronauts.

Hodgson Glass Research Laboratory — Athens, GA

**Undergraduate Researcher** *August '14 – April '15*

I assisted Dr. Johnson Turner with technical advice and programmed/designed environments for digital music systems.

**Google Glass Development** *August '14 – April '15*

I helped develop the first musical score viewing application for Google Glass. This application was used in concert across multiple Google Glass units.

**Smart Podium Development** *August '14 – April '15*

I developed a digital smart podium for the use of a band director. The goal was to allow synchronized music editing and notation.

The Home Depot Innovation Center — Atlanta, GA

**Research & Development Intern** *April '14 – August '14*

I worked as a software developer intern at The Home Depot's Innovation Center. I was part of the Center's first group of interns and helped to justify its existence within the company.

**Google Glass Research & Development** *April '14 – August '14*

I developed an Augmented Reality Google Glass application using a low level OpenCV libraries and data structures. The goal was to assist with product recognition, allow for barcode scanning, and quick product searches.

**Virtual Reality Research & Development** *April '14 – August '14*

I developed a Virtual Reality application with Google Cardboard using low level OpenCV libraries and data structures. The goal was to display heat maps of various product data over store shelves to assist with product placement.

## Research

Thesis: ; Paper: ; Conference Presentation: ; Conference Poster:

Development of a High-Performance, Heterogeneous, Scalable Test-Bed for Distributed Spacecraft

**IEEE Aerospace Conference** *Big Sky MT, 2023*

Caleb Adams, Brian Kempa, Walter Vaughan, Nicholas Cramer

Rapid Spacecraft Payload Development: In-Orbit Demonstration of Flight Software Reuse, Scalability, and Dependability

**Fligt Software Workshop** *Pasadena CA, 2023*

Walter Vaughan, Caleb Adams, Sergei Gridnev, Nick Cramer, Alice Anlind, Eric Brune, Oskar Flordal, Fredrik Bruhn, Alan George

A Hardware Accelerated Computer Vision Library for 3D Reconstruction Onboard Small Satellites

**IEEE Aerospace Conference - *Best Paper in Track*** *Big Sky MT, 2021*

Caleb Adams, Jackson Parker, David Cotten

Design and Testing of Autonomous Distributed Space Systems

**The AIAA/Utah State Small Satellite Conference - Small Sat** *Logan UT, 2021*

Nicholas Cramer, Daniel Cellucci, Caleb Adams, Adam Sweet, Mohammad Hejase, Jeremy Frank

High Performance Computation with Small Satellites and Small Satellite Swarms for 3D Reconstruction

**Master's Thesis - The University of Georgia** *Athens GA, 2020*

Caleb Adams, Committee: Dr. Ramviyas Parasuraman, Dr. David Cotten, Dr. Michael E. Cotterell, Dr. WenZhan Song

The Spectral Ocean Color Imager (SPOC) - An Adjustable Multispectral Imager

**The AIAA/Utah State Small Satellite Conference - Small Sat** *Logan UT, 2019*

David L Cotten, Nicholas Neel, Deepak Mishra, Marguerite Madden, Caleb Adams, Susanne Ullrich, Adrian Burd, Malcolm Adams, Kaitlyn Summey, Casper Versteeg, Jackson Parker, Fred Beyette

Towards an Integrated GPU Accelerated SoC as a Flight Computer for Small Satellites

**IEEE Aerospace Conference** *Big Sky MT, 2019*

Caleb Adams, Allen Spain, Jackson Parker, Matthew Hevert, James Roach, David Cotten

Towards an Integrated GPU Accelerated SoC as a Flight Computer for Small Satellites

**IEEE Aerospace Conference** *Big Sky MT, 2019*

Caleb Adams, Allen Spain, Jackson Parker, Matthew Hevert, James Roach, David Cotten

Selected Software Demonstrations from the Multiview Onboard Computational Imager Satellite

**Space Innovations Symposium** *Atlanta GA, 2018*

Caleb Adams, Jackson Parker

GPU Accelerated SoCs as Flight Computers for Small Satellites

**Space Innovations Symposium** *Atlanta GA, 2018*

Caleb Adams, Allen Spain, Jackson Parker, David L. Cotten

What are Cubesats? A look at UGA Space Exploration

**UGA Physics and Astronomy Colloquium - Invited Speaker** *Athens GA, 2018*

Caleb Adams, Katie Summey, Nicholas Heavner

A Near Real Time Space Based Computer Vision System for Accurate Terrain Mapping

**The AIAA/Utah State Small Satellite Conference - Small Sat** *Logan UT, 2018*

Caleb Adams, David L. Cotten

Batch Analytical Comparisons of on Orbit Multiview Stereo

**Space Innovations Symposium** *Atlanta GA, 2017*

Caleb Adams, Nicholas Neel, David L. Cotten

Feature Matching from Orbiting Vehicles

**Space Innovations Symposium** *Atlanta GA, 2017*

Nicholas Neel, Caleb Adams, David L. Cotten

Concept of Operations in Small Satellite Functionality

**Space Innovations Symposium** *Atlanta GA, 2017*

Bjorn Leicher, Paige Copenhaver, Caleb Adams, James Roach, David L. Cotten, Deepak Mishra

The Feasibility of Structure from Motion over Planetary Bodies with Small Satellites

**The AIAA/Utah State Small Satellite Conference - Small Sat** *Logan UT, 2017*

Caleb Adams, Nicholas (Hollis) Neel, David Cotten

Structure from Motion from a Constrained Orbiting Platform

**NASA/CASIS ISS Research and Development Conference** *Washington D.C., 2017*

Caleb Adams, Nicholas (Hollis) Neel

(SP)ectral (O)cean (C)olor Satellite, Video Link

**Cubesat Developers Conference - Cal Poly** *San Luis Obispo CA, 2017*

Caleb Adams, David Cotten, Deepak Mishra, Nicholas (Hollis) Neel, Graham Grable, Khoa Ngo

Accuracy of Dense Point Clouds Given Varying Image Quality

**UGA CURO Symposium** *Athens GA, 2017*

Nirav Ilango, David Cotten, Caleb Adams, Nicholas (Hollis) Neel, Margerite Madden, Deepak Mishra

The Feasibility of Structure from Motion over Planetary Bodies with Small Satellite Systems

**UGA CURO Symposium** *Athens GA, 2017*

Caleb Adams

STEM Opportunities for Undergraduates Building Nanosatellites: the NASA CubeSat Program Georgia

**IGTF/ASPRS** *Baltamore MD, 2017*

D. Cotten, C. Adams, D. Mishra, M. Madden, S. Bernardes, K. Ngo, N. Neel, N. Ilango, M. Le Corre, G. Grable, A. King

Building a Small Satellite Research Program at the University of Georgia: UGA Payload Development for CubeSats

**IGTF/ASPRS** *Baltamore MD, 2017*

D. Cotten, C. Adams, D. Mishra, M. Madden, S. Bernardes, K. Ngo, N. Neel, N. Ilango, M. Le Corre, G. Grable, A. King

The SPectral Ocean Color (SPOC) Small Satellite Mission: From Payload to Ground Station Development and Everything in Between

**AGU** *San Francisco CA, 2016*

David L. Cotten, Sergio Bernardes, Deepak Mishra, Caleb Adams, Hollis Neel, Khoa Ngo, Megan LeCorre, Paige Copenhaver, Nirav Ilango, Adam King, Graham Grable, Paul Hwang

Enhancing STEM Education through CubeSats: Using Satellite Integration as a Teaching Tool at a Non-Tech School

**AGU** *San Francisco CA, 2016*

David L. Cotten, Sergio Bernardes, Deepak Mishra, Caleb Adams, Hollis Neel, Khoa Ngo, Megan LeCorre, Paige Copenhaver, Nirav Ilango, Adam King, Graham Grable, Paul Hwang

Feasibility of Structure from Motion over Planetary Bodies using Small Satellites

**Georgia Scientific Computing Symposium** *Athens GA, 2016*

Caleb Adams, David L. Cotten, Nicholas (Hollis) Neel, Kyle Hamilton, Jacob Conley, Deepak Mishra

*Please visit my website, or click the links above, for more details on my research*

## Grants Funded

NASA Ames: 2022 CIF

**NASA Ames Center Innovation Fund** *2022*

NASA Ames internal funding awarded via competitive selection.

UNP NS-9: Phase B

**University Nanosatellite Program, Nano-Sat 9 Phase B** *2018*

The Air Force Research Lab's Nano Satellite Program funded the UGA SSRL, as the winner of phase A, $600,000 to build and operate the MOCI satellite.

UGA: CTL

**The Design and Construction of Equipment for Ground to Space Communications** *2017*

An internally awarded by the Center for Teaching and Learning for the construction of a space ready ground station at UGA.

UGA: Parents Leadership Council

**Providing Undergraduate Students Equipment for Ground to Space Communications** *2017*

An internally awarded by the Parents Leadership Council to help obtain ground support equipment for the Small Satellite Research Lab.

NASA USIP

**The NASA Undergraduate Student Instrument Project** *2016*

The NASA Undergraduate Student Instrument Project funded the UGA SSRL $200,000 for the design, construction, and launch of the SPOC satellite.

UNP NS-9: Phase A

**University Nanosatellite Program, Nano-Sat 9 Phase A** *2016*

The Air Force Research Lab's Nano Satellite Program funded the UGA SSRL for $180,000 to design and prove the mission architecture for the MOCI satellite.

*Grants listed above have me listed as an **author**, significant contributor, and/or essential personnel.*

## Awards, Honors & Fellowships

IEEE Aerospace Conference

**Best Paper Track 5: Observation Systems and Technologies** *2021*

I received the Best Paper award for Track 5: Observation Systems and Technologies for my paper on 3D reconstruction using small satellites.

Georgia Space Grant Consortium

**Fellowship** *2018*

I was selected to receive a fellowship from the Georgia Space Grant Consortium. I was awarded 10k in total funding, this was used to further develop the UGA SSRL's high performance processing units.

UNP Phase B

**Phase A Winner** *2018*

The MOCI satellite was selected as the winner of the 9th iteration of the University Nanosatellite Program, selected first out of 10 competing programs, and awarded over $600,000 dollars in phase B funding.

TEDx UGA

**TEDx UGA Student Idea Showcase** *2016*

I was selected as a presenter at TEDx UGA's student idea showcase. I spoke about the importance of space exploration, citizen science, and the democratization of space with small satellites.

HackGT

**Top 8** *2016*

I led a team that won top 8 at Georgia Tech's Major League Hacking (MLH) Hackathon. We built a drone from scratch that planted seeds. We were selected among 500 of our peers.

NASA Johnson EV3

**Team Excellence** *2015*

While working at NASA's Johnson Space Center I was awarded for going above and beyond requirements by staying late nights, and over night, to perform thermal vacuum tests on a payload.

VT Hacks

**Winner** *2015*

I lead a team that won Virginia Tech's 2015 Major League Hacking (MLH) Hackathon. We built a remote operated telescope and competed with 1000 of our peers.

## Leadership Experience

Subtopic Manager, Neuromrophic Computing — Mountain View, CA

**Project Manager** *2023 – present*

I manage NASA's SBIR/STTR program for Neuromrophic Computing

Distributed Spacecraft Autonomy (DSA) — Mountain View, CA

**Project Manager** *2022 – present*

I manage and direct a group of developers, engineers, researchers, and interns. Work directly with NASA HQ and Ames Leadership to meet milestones and deliverables.

Neural Radiance Methods — Mountain View, CA

**Principal Investigator** *2022 – present*

I manage and direct a small group of interns and researchers.

UGA Small Satellite Research Laboratory — Athens, GA

**Co-Founder, Program Manager** *2016 – 2020*

With two of my friends, I created the foundations of the UGA SSRL. I have since lead it to receive almost a million dollars in funding as it constructs UGA's first satellites.

Space Innovations Symposium — Atlanta, GA

**Session Chair, Organizer** *2019*

I helped organize the 3rd Space Innovations Symposium in Atlanta Georgia at Georgia Tech, where I chaired a session of the symposium. I also helped by getting students and organizations in the Athens area to attend the symposium.

Head TA - CS 1302 Software Programming — Athens, GA

**Head TA** *2018 – 2020*

The CS 1302 class at UGA is when most Computer Science students first experience significant programming. It takes them from simple terminal applications to complex GUI-based applications with large codebases. I manage a team of about 10 other TAs (varies by semester) who help run this class of 300+ students. I manage grading criteria, rubrics, coding projects, auto-grading systems, and hold office hours to help students understand the subject.

Hyve Robotics and AstroVisual — Athens, GA

**Co-Founder** *2015 – 2018*

I Co-Founded two companies, Hyve Robotics and AstroVisual. AstroVisual began by selling smartphone enabled telescopes for astrophotography. AstroVisual ceased operation when its members founded the UGA Small Satellite Research Laboratory. Hyve robotics created food delivery robots and was acquired by Cosmic Delivery in Q1 2018.

UGA Hacks — Athens, GA

**Co-Founder** *2015 – 2016*

With two of my friends, I helped to create UGA's official Major League Hacking (MLH) Hackathon program, which still exists today. The organization helps get Computer Science students excited about programming by presenting them with difficult, relevant challenges.

UGA Redcoat Band — Athens, GA

**Section Leader** — *2014 – 2015*

I led the UGA Redcoat Band's trombone section. I helped organize events, conduit rehearsals, arrange and teach music.