# About

Hi, I’m Andrea Vu.

I’ve been a professional student for four years (and counting!) and worked in industry for three years. I enjoy hands-on, experiment-focused research, which means piloting a robot to climb up peoples’ legs or watching my experiment plummet out of the sky into the desert.

Working with my hands has always been a huge part of my life, whether it be shoving an aluminum can in the fusebox of a tractor or using a wall scraper to uncap honeycomb frames. Understanding the role that an object plays in a larger system, defining that role, then breaking that definition is what helps us to expand the capabilities of modern technology. A conventional solution may be the easy fix, but an unconventional approach feeds creativity and innovation. Growing up near several farms in Georgia, driving a Pack Mule through pastures, freshly tilled fields, and the woods, which sparked my love for unconventional controls. The principle of driving off-road is the same as when driving on the blacktop, but more exciting when you get to avoiding chickens, jumping hills, and drifting around trees. Unconventional controls play an inherent role in our everyday lives and I am interested in characterizing and implementing those behaviors in a way that helps humanity, whether it be through safety or search and rescue.

My research interests lie in hardware design and controls which led me to pursue my Bachelor’s in Mechanical Engineering at Georgia Tech. While in undergrad, I worked and did research at Earthly Dynamics, where I specialized in aerial decelerators, specifically parafoils. I really enjoyed doing research, so I chose to pursue a Master’s Degree in Mechanical Engineering at Carnegie Mellon University. I want to dedicate my life to the mysteries of research and earn my PhD.

Programming: Python, Matlab, Julia, Embedded C/C++

Rapid Prototyping: 3D Printing, Laser Cutting, CNC Mill, Manual Mill, Sewing, Hand Tools, Soldering

Design: Solidworks, KiCad, Altium, Fusion 360

Simulation: ROS1, pyBullet, COMSOL

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# Experience

## Professional/Work

### ***Mechanical Engineer @ Earthly Dynamics***

May 2021 – August 2024

* Conducted experimental research on paraglider aerial deployment dynamics, investigating causes of asymmetric inflation and collapse to inform reliable high-performance wing deployment strategies.
* Developed and validated a novel aerial deployment system through iterative prototyping and flight testing in collaboration with the U.S. Army CCDC Soldier Center and industry partners.
* Integrated mechanical design with empirical testing and data analysis to advance understanding of paraglider inflation behavior and support the transition of PEGASYS from proof-of-concept to functional research prototype.
* Designed and tested Dropmate v2.0, an IP67-rated parachute event logger, including mechanical housing design (O-ring sealing, breathable vent integration) and environmental validation in saltwater and humidity.
* Modified and evaluated small-scale paragliders (ram-air and single-surface) to assess aerodynamics and venting strategies, supporting scalable design insights for full-sized platforms.
* Supported lab infrastructure by maintaining 3D printing systems (Prusa MK4s), fabricating prototypes, and troubleshooting hardware for rapid test iteration

Skills:

* Mechanical Assembly and Integration
* Solidworks

## Education

Mechanical Engineering, B.S. @ Georgia Institute of Technology

Highest Honors

Graduated December 2022

Mechanical Engineering, M.S. @ Carnegie Mellon University

Research Track

Expected Graduation May 2027

## Extracurricular

### ***Prototyping Instructor @ Flower’s Invention Studio***

January 2021 - December 2022

As a Prototyping Instructor, I served as a hands-on mentor in one of the country’s largest, student-run makerspace, guiding peers in operating advanced fabrication tools and overseeing safe project development. I helped to turn concepts into functional prototypes by helping students select proper fabrication methods, understand tool capabilities, and safely bring their visions to life.

Accomplishments:

* Mentored 100+ students through hands-on tool-use and prototype phases, allowing their projects to transform from a concept into a tangible result
* Trained student for safe, effective operation of 3D printers, laser cutters, CNC mills, metal-working tools, waterjet, wood-working tools, electronics tools, sewing machines, and routers.
* Troubleshooted mechanical and fabrication issues for various tools in the makerspace

Skills:

* 3D Printing (FDM and Resin)
* Laser Cutting
* Laser Etching
* Manual Mill
* CNC Mill (3-Axis)
* Waterjet
* Metal Working Tools
* Wood Working Tools
* Sewing Machines
* Soldering
* Design for Manufacturing

### ***Metal CNC Apprentice @ Flower’s Invention Studio***

January 2021 - December 2022

In addition to my role as a Prototyping Instructor, I supported the metal shop’s CNC operations by programming, setting up, and maintaining milling equipment to assist students in translating their designs into precision-machined parts. In conjunction with the other Metal CNC apprentices and the Metal CNC Master, we upheld rigorous safety and quality standards while fostering hands-on fabrication learning for a wide variety of academic, research, and personal projects.

Accomplishments:

* Developed CAM in Fusion 360 for several prototype components, ensuring safe, successful, and accurate machining
* Programmed and operated CNC mills for student projects, including creating soft jaws for work-holding, choosing appropriate surface finishes, and proper tooling choices
* Performed preventative maintenance and diagnosed issues on CNC equipment, identifying tolerancing issues, axis calibration, and tool wear

Skills:

* Manual Mill
* CAM
* Precision machining and fixturing
* Equipment maintenance and diagnosis
* CNC Programming
* Design for Manufacturing

### ***Student Advisory Committee Member @ Woodruff School Student Advisory Committee***

August 2020 - December 2022

As a student representative on the Woodruff School Student Advisory Committee (WSSAC), I served as a direct voice for my peers, collaborating with faculty and administration to shape policies and initiatives that enhance the student experience in the Mechanical Engineering School. I worked to translate student perspectives into actionable feedback and contributed to discussions on curricular, co-curricular, and resource-allocation matters.

Accomplishments:

* Collected and voiced feedback from dozens of peers in the Mechanical Engineering school, presenting key themes to faculty leadership to influence decision making on academic resources and student services
* Spearheaded efforts to improve communication between students and faculty
* Collaborated with committee members to review and refine school policy drafts, helping ensure that student needs were incorporated into final approvals

### ***Social Media Coordinator @ The Campus Kitchen Project***

August 2020 - December 2022

As the Social Media Coordinator for the Campus Kitchen Project, I managed the organization’s digital presence to promote food insecurity in college students, food sustainability, and waste-reduction initiatives across campus. I established the team’s online identity and outreach strategy, helping connect more volunteers, donors, and campus organizations to our mission of fighting food insecurity.

Accomplishments:

* Created and launched the organization’s email, Instagram page, and Linktree, establishing a cohesive digital presence that increased volunteer engagement and overall visibility in the greater Atlanta community
* Expanded outreach to Greek life in addition to campus dining halls, leading to new partnerships with other campus organizations that contributed to higher food recovery rates and more consistent donation streams
* Coordinated meal donations with the on-campus food pantry, STAR, and off-campus community fridges, churches, and homeless shelters

Skills:

* Social media management
* Branding and digital marketing
* Community engagement and outreach coordination

### ***Vice President of Finance @ Students Organizing for Sustainability***

March 2021 – March 2022

As VP of Finance, I managed the budgeting, fundraising, and resource allocation that supported Students Organizing for Sustainability’s (SOS) mission of promoting sustainable practices and urban gardening on campus via the community garden and other green initiatives. During my term, I oversaw the major 10x expansion of the community garden on Georgia Tech’s campus and secured funding to equip it with the necessary supplies to support the expansion and increase the impact across the campus community.

Accomplishments:

* Led fundraising efforts and submitted donation/grant applications that provided the financial means for SOS’s garden expansion and urban, gardening projects
* Directed financial planning for the community garden’s expansion (including seeds, tools, soil, and garden beds), supporting the increase of garden size by 10x
* Developed and implemented a budget tracking system and reporting framework for the organization to improve transparency and financial stewardship when reporting to the Student Organization Finance Office (SOFO)

### ***Buggy Driver @ SAE Buggy Team***

January 2025 - April 2026

As an avid racing enthusiast, I served as lead driver and active fabricator on the SAE Buggy Racing Team, building the vehicle that I race in, coordinating early-morning training, and engaging with sponsors and SAE alum. I laid carbon fiber, assembled the vehicle, and fostered team commitment by recruiting and organizing weekend volunteers and practice runners, while representing the team with alumni and sponsors to secure financial support and maintain good relations.

Accomplishments:

* Organized and motivated a crew of runners for early-morning weekend practice sessions, improving coordination between driver, pushers, and crew.
* Engaged with SAE alumni and sponsors to showcase the new buggy, expressed team appreciation, and strengthened sponsorship relationships to support budget and material contributions
* Placed 11th in Women’s and 13th in Men’s Races for 2025 Carnival (First time racing)

Check out our design competition presentation here:

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# Projects

### ***MPC for F1-10th Vehicle @ Optimal Controls and Reinforcement Learning***

January 2025 – May 2025

I developed a dynamically accurate simulation platform for an F1-10th scale racecar to study high-performance control strategies such as line-following and autonomous drifting. By implementing a nonlinear vehicle dynamics model with a simplified Pacejka tire model and integrating a Model Predictive Controller (MPC), I optimized the F1-10th vehicle for stability, speed, and cross-track performance around the Silverstone Grand Prix circuit. I extended the framework to identify drift equilibrium points and transition between grip and drift modes through linearized Jacobian Models.

Accomplishments:

* Designed and validated a nonlinear dynamic bicycle model incorporating Pacejka tire dynamics for realistic high-speed vehicle simulation
* Implemented an MPC framework that minimized cross-track and heading error while optimizing velocity and steering smoothness on a diverse race track
* Derived and linearized drift equilibrium models to enable predictive control of steady-state drifting and mode transitions between grip and drift

Skills:

* Nonlinear Dynamics
* System Linearization
* Julia
* Simulation

### ***Scratch 2K Buggy Building @ SAE Buggy Team***

January 2025 - April 2026

I participated in the full build of a competition-grade, man-powered “buggy” for Carnegie Mellon University’s annual spring carnival. As the driver, the buggy was fit to my proportions. We built the buggy using a combination of carbon fiber and epoxy, followed by the addition of wheels, a custom steering and braking system, and push bar. The result was a lightweight, structurally sound vehicle optimized for speed, handling, and reliability when raced.

Accomplishments:

* Designed a custom, interior mold based on driver dimensions, enabling an optimized fit and streamlined aerodynamics
* Fabricated major structural components by laying carbon fiber and epoxy, curing and trimming composite shells to achieve targeted strength-to-weight ratio
* Assembled and integrated mechanical systems, including wheels, bearings, steering, braking, and drivetrain mounting, to ensure proper alignment and fitment for race conditions.

Skills:

* CNC routing
* Composites
* Design for Manufacturing
* CAD Modelling
* Mechanical Assembly
* Material Selection

### ***Hasselhoff Bot @ Carnegie Mellon University***

August 2024 – December 2024

I did the mechanical and electrical design of the remote control for the Hasselhoff Bot, a small, teleoperated underwater robot inspired by David Hasselhoff’s cameo in *The SpongeBob SquarePants Movie.* This project was part of the Advanced Mechatronic Design class at CMU. The robot is equipped with four waterproof motors, an IR beam receiver, and a tethered remote control, allowing users to navigate underwater and land on an IR beam. The remote control has 5 LEDs indicating the state of the submarine, two joysticks to allow the user to steer the submarine, a read out of the time elapsed since start, a read out of the current depth of the submarine, and a knob to set the desired depth.

Accomplishments:

* Designed and developed the electrical schematic for the remote control to include 5 LEDs, 2 joysticks, an LED display, and a potentiometer.
* Tested the electrical schematic on a breadboard before soldering the components to protoboards for the final prototype
* Developed C code on a Nucleo STM32 to communicate with the submarine, configure timers, ADCs, DMAs and GPIO pins to implement a state machine

Skills:

* Embedded Systems
* Mechanical Design
* CAD modelling
* Electrical Design

### ***Dropmate 2 @ Earthly Dynamics***

January 2023 - July 2023

Due to the proprietary nature of this project, the details of this work is limited to publicly released information.

I designed and tested the O-ring and breathable vent for Dropmate 2, the parachute event logger, ensuring that the outer shell of the device met IP67 water egress standards in both fresh and saltwater environments. This involved developing a hermetic seal to protect sensitive electronics while allowing for gas permeability, which is crucial for accurate barometric pressure readings during jumps.

Accomplishments:

* Designed a custom O-ring seal to maintain IP67 compliance, ensuring the device remained waterproof and dustproof when the parachute is being actively deployed, stored, or transported.
* Selected and integrated the proper material for a breathable vent system that permitted gas exchange without compromising the device’s water resistance to allow for accurate altitude measurements.
* Conducted rigorous testing in both fresh and saltwater to validate the device’s performance to ensure reliability and durability in diverse conditions

Skills:

* CAD Modelling
* Design for Manufacturing
* Rapid Prototyping

### ***Small-Scale RC Paramotor @ Earthly Dynamics***

August 2022 – December 2022

Due to the proprietary nature of this project, the details of this work is limited to publicly released information.

I designed and prototyped a custom, small-scale RC paramotor to serve as a versatile data collection platform for parafoil system identification. I utilized CAD modelling to back integrate the new, custom chassis onto a COTS hobbyist RC paramotor, expanding the COTS paramotor’s abilities to better accommodate research needs. This platform enables controlled launches from the ground or aerial deployment, allowing pilots on the ground to steer and conduct repeated trials to better characterize parafoil deployment and inflation dynamics.

Accomplishments:

* Modified a COTS hobbyist RC paramotor to accommodate custom payloads, expanding its suitability for controlled data collection in parafoil testing
* Developed a CAD model for a custom, lightweight electronics, sensor, and control enclosure
* Conducted multiple flight trials, collecting data to support system identification and control algorithm development for parafoil dynamics

Skills:

* CAD
* Motor and Gearbox selection
* Power electronics
* Rapid prototyping
* Electronics layout
* Sensor selection

# Research

## Bleed-Air of a Single Surface Parafoil (BASS)

January 2021 – August 2024

Research Advisor: Dr. Mark Costello

Research Area: Aerodynamics, Hardware Design, Experimental Flight Testing, Unconventional Control Actuation, and Parafoil/Canopy Design

In collaboration with Dr. Jeffrey Ward, I conducted experimental and computational studies on bleed-air actuation for single-surface parafoils, aiming to expand the control authority for precision airdrop applications. This research investigates the aerodynamic effects of strategically placed upper-surface vents on parafoil performance. Findings indicate that vent placement significantly influences turn rate and glide slope control, with optimal locations achieving up to 40 degree/second turn rates and 58% glide slope changes.

Accomplishments:

* Designed vent shapes for bleeding air, then altered small-scale parafoils based off results from computational model that simulated the effects of bleed-air spoilers on parafoil aerodynamics
* Conducted flight tests to assess the impact of vent placement on turn rate and glide slope control, providing empirical data to validate computational predictions
* Identified optimal vent locations at 10% chord position for maximizing control authority

Publications:

* Ward, D. J., Vu, A. L., and Costello, M, “Bleed Air Actuation for a Single Surface Parafoil,” AIAA AVIATION Forum and ASCEND 2024, paper AIAA 2024-4519, July 2024.
* Ward, D. J., Vu, A. L., and Costello, M., “Control Authority of a Single-Surface Parafoil with Bleed-Air Spoilers,” Journal of Aircraft, Vol. 61, No. 6, pp. 1–7. https://doi.org/10.2514/1.C037791, URL https://doi.org/10.2514/1.C037791.
* Ward, D. J., Vu, A. L., Ward, M., and Costello, M., “Bleed-Air Control of a Single Surface Parafoil Canopy,” American Institute of Aeronautics and Astronautics Inc, AIAA, 2022. https://doi.org/10.2514/6.2022-2716

## Precision and Extended Glide Airdrop System (PEGASYS)

February 2023 – August 2024

Disclaimer: Due to the proprietary nature of this project, the details of this work is limited to publicly released information.

Research Advisor: Dr. Mike Ward

Research Area: Aerodynamics, Experimental Flight Testing, Unconventional Control Actuation,

Hardware Design, and Deployment and Extraction Dynamics

I developed the proof-of-concept, development, and testing of the Precision and Extended Glide Airdrop System, a high-performance powered paraglider system designed for cargo delivery. This system aims to enhance the precision and range of airdrop operations, enabling payloads to be delivered accurately over extended distances from aircraft, thereby reducing the risk to aircrews in contested environments. The project involved collaboration with the US Army’s DEVCOM Soldier Center and Aerial Delivery Solutions.

Accomplishments:

* Lead and executed multiple flight tests to validate system performance across multiple test beds
* Analyzed flight data to assess the viability and consistency of paraglider performance and better inform design improvements
* Refined deployment strategies and payload capacity to assess various deployment conditions

Articles:

* <https://aerospaceamerica.aiaa.org/year-in-review/u-s-army-tests-gravity-airdrop-high-altitude-parachutes-and-powered-paragliders/>
* <https://earthlydynamics.com/pegasys-a-powered-paraglider-air-deployment-program/>

## Jamming Gait for a Snake Robot

Disclaimer: This is a work in progress.

Research Advisor: Dr. Howie Choset

Research Area: Controls, Gait Design, Robot Manipulation, Motion Planning, Hardware Design

I am currently working to expand the locomotion versatility of snake robots by enabling them to explore non-simple, 3D environments through the development of a new gait. The gait allows segments of the robot’s body to alternate between anchoring for stability or articulate for motion, enabling the robot to perform a hybrid mobility-manipulation behavior. The project emphasizes kinematic modelling, constraint-based optimization, and motion planning for complex environments.