James Monaco

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PhD Candidate at University of Colorado Boulder
Department of Aerospace Engineering & Sciences
Focused on Remote Sensing, Earth & Space Science

In my first year of PhD candidacy, working on small satellite projects and ground-based remote sensing research.

SKILLS

- Radio Frequency Communication
- GPS & Satellite Systems
- Analog and digital circuit design and debugging
- OrCad/Pspice design and simulation
- Embedded systems
- Fabrication: Machining, welding (MIG and TIG), CNC fabrication, 3D printing, laser cutting
- Strong writing and interpersonal skills
- VHDL, Verilog
- Python
- MATLAB
- Java
- C
- Bash Scripting
- SolidWorks

EDUCATION

University of Colorado Boulder — Boulder, CO. USA
Smead Aerospace Engineering & Sciences — *Started August 2021*
PhD Candidate, Focused on Remote Sensing & Earth Sciences

Dartmouth College, Thayer School of Engineering — Hanover, NH, USA
Bachelor of Engineering, Focused on Electrical Engineering — *Graduated June 2021*
GPA: 3.85

Hobart and William Smith (HWS) Colleges, Summa Cum Laude — Geneva, NY, USA
Bachelor of Science in Physics and Chemistry — *Graduated May 2020*
Minor in Environmental Studies
GPA: 3.90

Honors and Awards:

- Phi Beta Kappa member (HWS, 2020)
- Tau Beta Pi member (Dartmouth, 2021)
- Hobart Trustees Scholar recipient (HWS)
- Hobart Dean's Citizenship award (HWS, 2020)
- The Ralph Hadley Bullard Prize in Chemistry (HWS, 2020)
- Dartmouth Society of Engineers Prize (Dartmouth, 2021)
- Henry David Thoreau Scholarship recipient (independent scholarship)
- The Sutherland Prize in Natural Sciences (HWS, 2020)
- First Year Writing Prize Nominee (HWS, 2016)

RESEARCH EXPERIENCE

MAXWELL: University Nanosatellite Program CU Boulder, Aerospace Dept.
Developed the Ground Station for Satellite Communications *Fall 2021 - Present*

- Developed a ground station to communicate with the satellite while in orbit
- Worked across subgroups, actively a part of the communications (COMMs) and command and data-handling (C&DH) teams
- Modified and tested GNU Radio scripts for satellite communication (uplink and downlink)
- Configured telemetry and control software to interface with high-frequency communication systems

Meteor Radar Project CU Boulder, Aerospace Dept.
Meteor detection and tracking for upper atmosphere wind estimation *Fall 2021 - Present*

- Verified and validated PCB designs for powering ground station receiver units
- Gained experience in Altium board designer

Solid-Phase Anti-Cancer Organic Synthesis HWS Chem. Dept.
Synthesized a novel chemotherapeutic compound *Spring, 2020*

- Learned and practiced organic synthesis techniques
- Worked in a small lab group to complete a multi-step synthesis of analog of FK228, a known histone deacetylase inhibitor
- Used spectral techniques to confirm the success of the synthesis
- Wrote an introduction to the project to practice scientific writing and gain a better understanding of the synthesis

Spectral Analysis Database Project HWS Chem. Dept.
Used spectral and analytical techniques to analyze chemical compounds *Spring, 2019*

- Focused on infrared spectroscopy, GC-MS spectrometry, ^{13}C and ^{1}H nuclear magnetic resonance spectroscopy, and several two-dimensional NMR techniques
- Analyzed over a dozen compounds using these analytical techniques
- Documented the analysis for each compound, to be used to teach intermediate organic chemistry students
- Confirmed other research group's success of synthesis through spectral analysis

Indoor Air Pollution Study: Environmental Chemistry HWS Chem. Dept.
A five-week study investigating seven pollutants over five locations *Fall 2019*

- In a group of four, a suite of logging sensors was placed in five locations to attempt to determine if any academic discipline had higher exposure to harmful indoor air pollutants
- The resulting data was analyzed using MATLAB and presented to the community to inform them of the results
- Five out of the seven key pollutants investigated were found to be over EPA limits in some locations, while four were over the limits in all locations

LEADERSHIP EXPERIENCE

Hobart and William Smith Engineering Club Geneva, NY, USA
President *Spring 2017 – Spring 2020*

- Designed and taught curriculum for club members to learn core engineering skills
- Oversaw logistics, budgeting, and timetables of projects
- Led projects that incorporated skills such as CAD work, circuit design and debugging, and microcontroller programming for groups of 6-20 students

CONFERENCES AND TALKS

Integrating Academia and Other Epistemic Communities Hanover, NH
Dartmouth's Convergence Symposium: bridging arts and sciences *February 2021*

- Presented a short talk on my weather satellite reception platform
- Explored how academic and informal epistemic communities made the project possible
- Talked about how academia can benefit from leaning on informal communities for knowledge, and vice versa

Finger Lakes Youth Climate Summit Geneva, NY
Presenting on behalf of HWS Engineering Club *April 2020*

- Showcased an automated garden recently completed by the HWS Engineering Club that waters, monitors, and lights itself
- Conveyed the importance of engineers' role in combating climate change and pollution
- Explained what it means to be an engineer to a high school audience

You are What You Breathe: Air Quality Study at HWS Geneva, NY
Presenting research to the community of Hobart and William Smith *December 2020*

- Centered around a five-week study that looked at seven indoor air pollutants across five locations was summarized
- In a group of four, a forty-minute talk detailed the findings that showed hazardous levels of CO, CO_2, NO_2, particulate matter, ozone, SO_2, and volatile organic matter
- Over thirty students and about half a dozen facility came to the 40-minute talk

PERSONAL AND ACADEMIC PROJECTS

Automated Transient Weather Satellite Reception *Summer, 2020*
Used a software-defined radio and Raspberry Pi to capture overhead weather satellite signals

- With a partner, wrote Bash and Python scripts to automate the capture and processing of signals, manage conflicts when two satellites are overhead at once, manage directories for daily data, and to automatically upload data to a cloud service
- Designed and 3D printed an assembly to make this project portable, durable, stand-alone, and inexpensive.
- Learned radio-frequency basics such as transmission lines, signal modulation and encoding, and antenna design

- Documented the work done, cumulating in an article on the novel contributions made so others can replicate our work

Automated Garden HWS Engineering Club
Led a group of 12 students to design and build an automated garden *Fall, 2019*

- Budgeted and planned a project timeline
- Taught students how to code a microcontroller, use CAD software to 3D print parts, and build the necessary circuits `
- Presented the project at a local Youth Climate Summit conference to convey the importance of engineering as a solution to pollution and climate change

FPGA Morse Code Translator Dartmouth College
Final Project for Digital Electronics Course *Spring, 2019*
Programmed an FPGA to allow user-inputted messages to be output as Morse code

- With a partner, VHDL was used to program the FPGA to interface with a computer, a speaker, and lights
- Learned about Boolean algebra, logic circuits, and transistor-level implementation of logic
- The FPGA took in a user's message through a terminal and output it Morse code by controlling LEDs and a speaker
- Interfaced between the computer terminal and FPGA via an RS232 connection

Analog Circuit Heartbeat Monitor Dartmouth College
Final Project for Analog Electronics Course *Winter, 2019*
Designed and built a heartrate monitor out of analog electronics

- Designed a circuit out of discrete analog components to process and filter the input heartbeat signal, then blink a light and buzz with every heartbeat
- Simulated all stages of circuit using OrCad/Pspice
- Built, tested, and debugged resulting circuit on a breadboard

Closed-Loop Inverted Pendulum Dartmouth College
Final Project for Control Theory Course *Spring, 2019*
Designed and built a hardware-implemented PD control system to balance a stick on its end

- Further developed skills of system modeling and stability
- Learned about and implemented closed-loop PID feedback control systems
- Designed compensators using root locus methods to achieve desired system characteristics

C-Based Search Engine Dartmouth College
Final Project for Software Development Course *Fall, 2020*
Created a search engine in C that takes in user queries and searches a set of webpages

- In a group of three, a search engine was created using C based off Google's original search engine architecture
- The search engine's scope was limited to the course's webpages
- Pages in the scope were crawled using breadth-first search, HTML parsed, each pages' words were indexed, and a command-line user interface was implemented

More academic and personal projects can be found on my portfolio at: Jamestmonaco.com

WORK EXPERIENCE

Thayer Machine Shop Hanover, NH
Teaching Assistant and Shop Helper *January 2019 – June 2021*

- Operated and maintained machinery including 3D printers, lathes, mills, CNC routers, and welding equipment
- Fabricated projects upon request, including machining and welding tools for the Student Formula Racing team
- Assisted in ensuring shop safety and cleanliness
- Taught SolidWorks and provided technical support to students, faculty, and researchers while the shop remained closed due to COVID-19

Teaching Assistant, Dartmouth College Hanover, NH
Electronics: Introduction to Linear and Digital Electronics January – March 2021

- Debugged physical circuits over zoom with students
- Assisted students in understanding and designing analog and digital circuits
- Graded homework

Teaching Assistant, Dartmouth College Hanover, NH
Digital Electronics March – June 2021

- Helped students debug VHDL projects over Zoom
- Taught hardware development language concepts like finite state machines, FPGA structure, and memory management
- Graded labs

Tutor Clearinghouse at Dartmouth Hanover, NH
One-on-One Tutor for ENGS 22: Systems January – June 2019

- Taught and clarified material from a difficult math-based engineering course
- Assigned two students a term for two terms

Assistant Program Director Boston, MA, USA
Community Boating, Inc. *April 2015 – August 2021*

- Ran the adult and adaptive sailing programs during operational hours by managing a up to 18 staff at a time
- Contributed to the design of the sailing curriculum
- Ensured safety on the docks and on the water, rescuing capsized boats when necessary and making executive decisions about the day-to-day operation of the programs
- Used my skills as an electrical engineer to modify adaptive sailing technology to better function and suit members' needs, such as improving Hoyer lifts and sip-and-puff control systems

Impax Auto Safety, LLC Hanover, NH
Engineering Research and Development Intern *September 2018 – January 2019*

- Designed and developed retractable tow hitch prototypes in a team
- Solely in charge of fabrication of prototypes though coding of microcontrollers (python), 3D printing, and circuit building
- Assisted in writing the patent application of the developed designs