

James Monaco

Electrical Engineering Student
Physics and Chemistry Graduate

Dual-degree student at Dartmouth College and Hobart and William Smith Colleges. I am looking for PhD Programs that will apply my engineering skills to satellite systems and space endeavors, remote sensing, or instrumentation development.

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SKILLS

- Analog and digital circuit design and debugging
- OrCad/Pspice design and simulation
- Fabrication: Machining, welding (MIG and TIG), CNC fabrication, 3D printing, laser cutting
- SolidWorks 2020
- Embedded systems
- Strong writing and interpersonal skills
- VHDL, Verilog
- Python
- MATLAB
- Java
- C
- Bash Scripting

EDUCATION

Dartmouth College, Thayer School of Engineering
Bachelor of Engineering, Focused on Electrical Engineering
GPA: 3.85

Hanover, NH, USA
Expected Graduation June 2021

Hobart and William Smith Colleges, Summa Cum Laude
Bachelor of Science in Physics and Chemistry
Minor in Environmental Studies
GPA: 3.90

Geneva, NY, USA
Graduated May 2020

Honors and Awards:

- Phi Beta Kappa member
- Hobart Trustees Scholar recipient
- Hobart Dean's Citizenship award (2020)
- The Ralph Hadley Bullard Prize in Chemistry (Hobart and William Smith, 2020)
- Henry David Thoreau Scholarship recipient
- The Sutherland Prize in Natural Sciences (Hobart and William Smith, 2020)
- First Year Writing Prize Nominee (2016)
- Bow Seat Ocean Awareness, Judges' pick in prose (2016)

WORK EXPERIENCE

Thayer Machine Shop

Hanover, NH

Teaching Assistant and Shop Helper

Ongoing, Started January 2019

- 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

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 through coding of microcontrollers (python), 3D printing, and circuit building
- Assisted in writing the patent application of the developed designs

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

PERSONAL 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, culminating in an article on the novel contributions made so others can replicate our work

Automated Garden

HWS Engineering Club, Fall, 2019

Led a group of 12 students to design and build an automated garden

- 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

LEADERSHIP EXPERIENCE

Hobart and William Smith Engineering Club

Geneva, NY, USA

Co-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

RESEARCH EXPERIENCE

Solid-Phase Anti-Cancer Organic Synthesis

HWS Chem. Dept.

Synthesized a novel chemotherapeutic compound

Spring, 2020

- Learned 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 ^1H 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

CONFERENCES AND TALKS

Integrating Academia and Other Epistemic Communities

Dartmouth's Convergence Symposium bridging arts and sciences

Hanover, NH

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

Presenting on behalf of HWS Engineering Club

Geneva, NY

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

Presenting research to the community of Hobart and William Smith

Geneva, NY

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, CO₂, NO₂, particulate matter, ozone, SO₂, and volatile organic matter
- Over thirty students and about half a dozen faculty came to the 40-minute talk

SELECTED PROJECT-BASED COURSEWORK: Engineering

Digital Electronics

Final Project: Morse Code Translator

Dartmouth College

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 Electronics

Final Project: Heartbeat Monitor

Dartmouth College

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

Control Theory

Dartmouth College

Final Project: Closed-Loop Inverted Pendulum

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

Software Development and Implementation

Dartmouth College

Final Project: Tiny Search engine

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

SELECTED RELEVANT COURSEWORK: Physics

Advanced Lab

Hobart and William Smith

A lab-intensive course design to build written and lab skills

Fall, 2019

- Completed several multi-week labs concerning particle physics, optics, electromagnetism, and other selected topics
- Wrote APS-style lab reports on each lab
- Gave conference-style presentations on selected labs

Symmetry and Conservation Laws

Hobart and William Smith

A high-level theory course

Fall, 2019

- Focused on Noether's theorem and its application to Lagrangian and Hamiltonian mechanics
- Investigated symmetries in field theory and supersymmetric quantum mechanics
- Addressed miscellaneous topics such as spontaneous symmetry breaking, the Korteweg-de Vries equation, and deep inelastic scattering

Physical Chemistry

Hobart and William Smith

A course highlighting the physics of chemical processes

Fall, 2017

- Covered topics in quantum mechanics and thermodynamics from a chemist's perspective
- Performed labs based off class topics

Electricity and Magnetism

A theory course covering the basics of E&M

Hobart and William Smith

Spring, 2020

- Addressed standard topics of electric and magnetic fields using Maxwell's equations applied in insulators, conductors, polarizable materials, and more
- Sharpened skills in vector calculus

Quantum Mechanics

A theory course in quantum mechanics

Hobart and William Smith

Fall, 2019

- Addressed standard topics in quantum mechanics such as quantum tunneling and the wave equation of the hydrogen atom
- Covered additional topics such as perturbation theory, WKV approximation, and two-level systems

OTHER EMPLOYMENT HISTORY

Dockmaster and Adaptive Sailing Instructor

Community Boating, Inc.

Boston, MA, USA

April 2015 – August 2019

- Ran the adult and adaptive sailing programs during operational hours by managing a group of 6-12 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