V. Hunter Adams, PhD

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Education

Cornell University

BA, Physics — August 2011 - December 2014
MS, Aerospace Engineering — January 2015 - June 2017
PhD, Aerospace Engineering, Advised by Mason Peck — June 2017-December 2019

Research and Professional Experience

Lecturer, Cornell University — January 2020 - Present

Electrical and Computer Engineering

- Teaching ECE 5760: Advanced Microcontroller Design and System-On-Chip. This is a lab-intensive course on development with FPGA's, specifically the Cyclone V from Altera.

Mechanical and Aerospace Engineering

- Taught MAE 4160/5160: Spacecraft Technology and Systems Architecture in spring, 2020. This is a project-based class that discusses how to build a spacecraft. Throughout the semester, each subsystem of a spacecraft is considered. Topics include power generation, propulsion and thrusters, communications, thermal management, etc.

Monarch Chip-Satellites — January 2015 - July 2020

Lead Engineer

- Designed all hardware, wrote all software, and performed all testing of a 5×5 cm, 2.5 gram, flexible spacecraft.
- Each spacecraft is capable of measuring acceleration, angular velocity, magnetic field, ambient light, and GPS information at >10 Hz. Data are communicated to ground stations via an onboard radio and radio antenna.
- Designed, built, and programmed a radio receiver (software defined radio/Raspberry Pi) that performs the digital signal processing necessary to receive data from the chip-satellites.
- Designed and built an FPGA-based radio receiver for increased signal processing speed (Cyclone V).

Cosmoptera, Inc. — January 2019 - July 2020

Co-Founder and CEO

- Co-founded a company for commercializing the Monarch chip-satellites, described above.
- Added temperature and humidity sensors to the Monarchs.
- Deployed 20 Monarchs at Cornell's research vineyard in Lansing, NY to perform distributed environmental sensing. Successfully gathered five weeks of environmental data.
- Deployed 10 Monarchs onto dairy calves at Sunnyside Farms in Scipio Center, NY to monitor activity levels.

Violet Satellite Project — February 2013 - January 2015

Program Manager

- Managed a team of 30 engineers constructing a high-agility satellite and acted as liaison to project sponsors at the Air Force Research Laboratory.
- Developed an Extended Kalman Filter for Violet spacecraft.

SpaceX — June 2014 - August 2014

Dragon Development Intern

- Wrote a de-orbit simulation in Python to support Dragon re-entry.
- Designed and built a rig that simulated the environmental conditions to which Dragon propulsive components would be exposed after a water landing. Used the rig to perform corrosion tests on components from the Dragon capsule in order to determine reusability for subsequent missions.

Electrolysis Propulsion CubeSat Team — January 2015 - June 2016

Navigation Team

- Developed and published an optical navigation algorithm that uses relative positions and sizes of the Earth, Sun, and Moon to determine spacecraft trajectory in cislunar space to within tens of kilometers.

Cornell Laboratory for Elementary Particle Physics — May 2012 - September 2013

Research Assistant

- Wrote software in C++/Python to analyze data from the Compact Muon Solenoid particle detector at the European Institute for Nuclear Research (CERN). Searching data specifically for supersymmetric top quarks.

Publications

- Probabilistic Packet Transmission Through a Limited-lifetime Deletion Channel with Arbitrary Deletion Probability. [first author] In review. IEEE Transactions on Aerospace and Electronic Systems. 2020.
- Theory and Applications of Gram Scale Spacecraft. PhD Dissertation. 2020.
- R-Selected Spacecraft. [first author] AIAA Journal of Spacecraft and Rockets. 2020.

- A Scalable Packet Routing Mechanism for Chip-Satellites in Coplanar Orbits. [first author] IEEE Transactions on Aerospace and Electronic Systems. 2020.
- A Probabilistic Network Formulation for Satellite Swarm Communications. [first author] AIAA Guidance, Navigation, and Control Conference. 2018.
- Interplanetary Optical Navigation. [first author] AIAA Guidance, Navigation, and Control Conference. 2016.
- Lost in Space and Time. [first author] AIAA Guidance, Navigation, and Control Conference. 2017.
- Data Prognostics Using Symbolic Regression. [first author] EngrXiv. 2015.

Teaching Experience

Lecturer (Cornell University)

- MAE 4160, Spacecraft Technology and Systems Architecture, spring 2020

Guest Lectures (Cornell University)

- GOVT 3042, The Politics of Technology, spring 2020, "Chipsats and spacecraft politics"
- ECE 6680, Bio-inspired Coordination of Multi-Agent Systems, spring 2020, "Chipsats: swarms in space"
- MAE 4060, Introduction to Spaceflight Mechanics, fall 2019, "Attitude Sensing Technologies"
- MAE 3780, Mechatronics, fall 2019, "C for folks that prefer Matlab"
- MAE 4060, Introduction to Spaceflight Mechanics, fall 2019, "Orbit and Constellation Design"
- NBA 5070, Entrepreneurship for Scientists and Engineers, fall 2019, "Customer Discovery"
- NBA 5640, Entrepreneurship & Business Ownership, spring 2018, "Monarchs for vineyard monitoring"
- MAE 6060, Spacecraft Attitude Dynamics, Control, & Estimation, spring 2018, "Estimation methods"

Teaching Assistant (Cornell University)

- MAE 3780, Mechatronics, fall 2019 (Lab TA)
- MAE 4160, Spacecraft Technology and Systems Architecture, spring 2019 (TA)
- MAE 6060, Spacecraft Attitude Dynamics, Control, and Estimation, spring 2018 (TA)
- ASTRO 1104, Our Solar System, spring 2017 (TA)
- MAE 3260, System Dynamics, spring 2016 (Lab TA)

Outreach and Student Engagement

NASA Aeronautics Design Challenge Advisor May 2019 - Present

- Faculty advisor for Cornell's participants in the NASA Aeronautics Design Challenge.
- Advised a team of 6 students as they design a drone using NASA's systems engineering process, as described in the NASA Systems Engineering Handbook.

Student Project Advisor January 2018 - Present

- Projects have included sonic communication among microcontrollers (Sebastian Colom), radio communication with microcontrollers (Alexander Mayo-Smith and Johnny Crossman), actuation of shape-memory alloys with microcontrollers (Sam Fiebel), optical communication among microcontrollers (Ryan Begin), and printable circuits (Philip Whitmarsh).

New Zealand Chipsat Workshop and Hackathon March 16 - March 17, 2019

- Developed a version of the Monarch chipsat that was capable of interfacing with new sensors.
- Developed a series of tutorials for using that chipsat, and put together development kits for a hackathon hosted at the University of Auckland.

NYC Maker Faire September 23 - September 24, 2017

- Co-hosted a chip-satellite booth at the NYC Maker Faire.
- Developed spacecraft hacker kits for Maker Faire visitors to use at the event and at home.

Intrepid Museum July 17, 2016

- Co-hosted a chip-satellite booth at the Intrepid Sea, Air & Space Museum.

Fellowships and Grants

- Cornell Scale-Up and Prototyping Award, 2019
- National Science Foundation Innovation Corps Fellowship, 2018
- Cornell Commercialization Fellowship, 2018
- New York Space Grant, 2017

Honors and Awards

- Best Presentation in Session, 2017 AIAA SciTech conference
- Best Presentation in Session, 2016 AIAA SciTech conference

Invited Talks

- "Spacecraft for vineyard monitoring." Cornell University Robotics Seminar, 28 April 2020, Zoom, Ithaca, NY.
- "Science of Cosmos: Seven Wonders of the New World." Carl Sagan Institute Science of Cosmos web series, 20 April 2020. Remotely recorded and available at https://www.youtube.com/watch?v=83gtXl5m8Ao

- "Tales of Commercialization." Cornell entrepreneurship event, 6 February 2020, Upson Hall, Ithaca, NY.
- "Monarchs for vineyard monitoring." Technology and business mixer, 3 September 2019, Big Red Barn, Ithaca, NY.
- "Customer Discovery Lessons Learned." Rev hardware accelerator program, 6 June 2019, Rev Ithaca Startup Works, Ithaca, NY.
- "Distributed vineyard sensing with Monarchs." Rev Hardware Heroes January Networking Night, 30 January, 2019, Rev Ithaca Startup Works, Ithaca, NY.
- "Space Exploration with Chip-Satellites." Carl Sagan Institute Coffee Hour, 13 December 2018, Upson Hall, Ithaca, NY.
- "Monarch Customer Discovery." Cornell commercialization fellows reception, 13 December 2018, Upson Hall, Ithaca, NY.
- "Monarchs: Lab to Customer." Technology Entrepreneurship at Cornell mixer, 5 December 2018, Upson Hall, Ithaca, NY.
- "Customer Discovery Lessons Learned." High Value Talent Retreat, 26 October 2018, Remote.
- "Monarchs for digital agriculture." Cornell Engineering College Council annual dinner, 25 October 2018, Lab or Ornithology, Ithaca, NY.
- "History, State of the Art, and Future of Gram-Scale Spacecraft." Breakthrough Femtosatellite Workshop, 29 September 2018, Grand Hotel, Bremen, Germany.
- "Monarch Chip-Satellites." Cornell Multi-Robot Symposium, 14 March 2018, Upson Hall, Ithaca, NY.

Conference Talks

- "Distributed, In-Canopy Environmental Sensing with Monarchs." Nelson J. Shaulis Digital Viticulture Symposium, 17 July 2019, Anthony Road Winery, Penn Yann NY.
- "A Probabilistic Network Formulation for Satellite Swarm Communications." AIAA SciTech, 9 January 2018, Gaylord Palms, Kissimmee, FL.
- "Lost in Space and Time." AIAA SciTech, 5 January 2017, Gaylord Texan Hotel, Grapevine, TX.
- "Interplanetary Optical Navigation." AIAA SciTech, 8 January 2016, Manchester Grand Hyatt, San Diego, CA.

Invited Workshops

- Starshot Communications Workshop, 8-9 May 2020, Zoom.
- Breakthrough Femtosatellite Workshop, 29 September 2018, Grand Hotel, Bremen, Germany.