Paul Horton

Exploration Systems Design (Systems Engineering) PhD Student

hortonpaul.com
github.com/pahorton
pahorton@asu.edu
520 869 1275

First-year PhD student in Exploration Systems Design (Systems Engineering) at Arizona State University's School of Earth and Space Exploration seeking to leverage a unique Software Engineering and Applied Physics background as well as two summer internships at NASA Jet Propulsion Laboratory's Machine Learning and Instrument Autonomy group to perform innovative research on the use of data science technologies to facilitate scientific discoveries in planetary science and astronomy.

Education

Arizona State University (ASU) *(italicized dates indicate anticipated graduation)*

May 2023 — **PhD in Exploration Systems Design (Systems Engineering)** — GPA : **4.00**
School of Earth and Space Exploration (SESE)

Dec 2019 — **MS in Software Engineering** — GPA : **4.00**
Ira A. Fulton Schools of Engineering
Thesis title : Simulating Atmosphere and the TolTEC Detector Array for Data Reduction Pipeline Evaluation

May 2018 — **BS in Applied Physics** — GPA : **4.01**
College of Integrative Sciences of Arts (CISA)
Graduated *summa cum laude* and Barrett, the Honors College Scholar
Honors thesis title : The History and Application of Optical Communications in Deep Space (both degrees)

May 2018 — **BS in Software Engineering** — GPA : **4.06**
Ira A. Fulton Schools of Engineering
Graduated *summa cum laude* and Barrett, the Honors College Scholar

Scholarships and Awards

2019-2020 — **JPL Strategic University Research Partnership (SURP)**
Funded research proposal for machine learning mission operations systems

2016-2017 — **Fulton Undergraduate Research Initiative (FURI)**
Funded research proposal for investigating engineering education at hackathons

2014-2018 — **Broadening the Reach of Engineering through Community Engagement (BRECE)**
Scholarship program and community for local and global engineering engagement

2014-2018 — **New American University Scholar - President's Award**
Scholarship program for incoming freshmen with outstanding academic qualifications

2014-2018 — **Undergraduate Dean's List (All Semesters)**

Professional Research Experiences

(† indicates citation in Publications and Presentations)

May 2019 to Aug 2019 — **Summer Internship, Machine Learning and Instrument Autonomy Group, NASA JPL, Pasadena, CA**
- Refined over 100 hand engineered features using parallel processing to increase classification efficiency and enable real time analysis of terrain features on a innervated rover wheel
- Optimized the readout process of embedded sensors on a robotic test rig to increase data collection rates

Data Science | Python | Embedded Systems | Parallel Processing | Feature Engineering | Terramechanics

May 2018 to Aug 2018 — **Summer Internship, Machine Learning and Instrument Autonomy Group, NASA JPL, Pasadena, CA**
- † Generated, refined, and utilized a data set of over 100 dust devil regions on Mars to perform feature augmentation using tubular image filtration for pixel based classification
- † Demonstrated the feasibility of COSMIC, an on-board analytic suite for Mars satellites to autonomously perform change and anomaly detection as well as summarization of the Mars surface

Data Science | Data Wrangling | Python | Machine Learning | Feature Engineering | Planetary Science

Academic Research Experiences

(† indicates citation in Publications and Presentations, ∗ indicates awarded project)

Aug 2019 to Present — **Graduate Research Assistant (PhD), Bell Research Group, ASU SESE, Tempe, AZ**

- ∗ Utilizing machine learning and human centered design to develop technologies for planetary scientists to intelligently perform data discovery and efficiently plan mission operations for Mars Science Laboratory

Data Science | Deep Learning | Python | Software Engineering | Planetary Science

Aug 2018 to Present — **Graduate Research Assistant (MS), Astronomical Instrumentation Lab, ASU SESE, Tempe, AZ**

- Developing a scientifically accurate simulation of high resolution 7000 detector readout data for TolTEC, a three-color millimeter wavelength camera on the Large Millimeter Telescope
- Implementing industry best practices to scientific code development by introducing version control, Docker, and documentation to a team of developers from 7 institutions across 3 countries

Software Engineering | Docker | GitHub | C++ | Python | Astronomy

Sept 2017 to May 2018 — **Undergraduate Research Assistant, Astronomical Instrumentation Lab, ASU SESE, Tempe, AZ**

- Collaborated with the Deep Space Optical Communications team at NASA JPL to create an adjustable simulation of Serially Concatenated Pulse Position Modulation (SCPPM) for the Physche mission

Optical Communications | Physics | Python

Aug 2016 to May 2017 — **Undergraduate Research Assistant, Maker Research Group, ASU Polytechnic School, Mesa, AZ**

- †∗ Applied deductive thematic analysis to investigate the hackathon ecosystem under a project based learning framework to identify engineering education in nontraditional learning environments

Engineering Education | Project Based Learning | Hackathons | Thematic Analysis

Publications and Presentations

1. **Paul Horton** and Lukas Mandrake. Feature augmentation using tubular image filtration for autonomous on-board classification of mars dust devil tracks. In *AGU Fall Meeting Abstracts*, 2018
2. **Paul Horton**, Shawn S Jordan, Steven Weiner, and Micah Lande. Project-based learning among engineering students during short-form hackathon events. In *Conference proceedings of American Society of Engineering Education (ASEE) annual conference and exposition*, 2018
3. Gary Doran, Erik Langert, Steven Lu, Lukas Mandrake, Kiri L. Wagstaff, Jimmie Young, Anneliese Braunegg, **Paul Horton**, Daniel Jeong, and Asher Trockman. COSMIC : Content-based onboard summarization to monitor infrequent change. *IEEE AeroConf*, Accepted

Projects

NavigateAR : An Augmented Reality Campus Navigation App - Undergraduate Capstone 2017 - 2018

gitlab.com/asu-capstone-team-6/ar-navigator

Utilized ARCore to develop a pedestrian focused augmented reality navigation Android app for ASU and State Farm. Development of this app was done in an Agile Scrum environment in collaboration with sponsors from State Farm.

Android | Augmented Reality | Agile | Java | Google Maps

SolarSPELL : Solar Powered Educational Learning Library - Design for the Developing World 2016 - 2018

SolarSPELL.org PacificSchoolServer.org

Led a development team to redesign the front and back end for an offline digital library to enable easier deployment using dynamic rendering and area specific version control. Additionally, I conducted on location technical trainings with over 50 Peace Corps. volunteers and their local teacher counterparts.

Web Design | AngularJS | Humanitarian Engineering | Human Centered Design

Extracurricular Activities

sunhacks - ASU's Largest Student Organized Hackathon (Formerly Desert Hacks) 2016 - Present

2018-2019 Director of Technology for sunhacks Fall 2019
2018-2018 Director of Marketing for sunhacks Fall 2018
2016-2017 Organizer and Founding Member for Desert Hacks Spring 2017