



Frances Zhu

Colorado School of Mines
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US Citizen

RESEARCH AREAS

Space Systems
Robotics
Autonomy

Dynamics
Optimization
Control Theory

System Identification
Machine Learning
Education Accessibility

EMPLOYMENT HISTORY

Assistant Professor of Space Robotics

Department of Mechanical Engineering
Graduate Cooperating Faculty in Robotics and Space Resources

January 2025 – Present

Co-Founder of Mahina Aerospace LLC

Assistant Researcher of Space Systems

Hawai'i Institute of Geophysics and Planetology, Manoa, HI
Graduate Cooperating Faculty in Mechanical Engineering, Electrical Engineering, Ocean Resource
Engineering, Information and Computer Science, and Earth Science

February 2023 – Present

January 2020 – December 2024

Deputy Director of Hawai'i Space Grant Consortium

January 2020 – June 2023

NASA Space Technology and Research Fellow

3.5 years at Cornell, Ithaca, NY. 1 year at NASA JPL, Pasadena, CA.

January 2015 – July 2019

EDUCATION

Cornell University, College of Engineering, Ithaca, NY

Ph.D. in Aerospace Engineering
Minor in Computer Science
Advisory Committee: Mason Peck, Hadas Kress-Gazit, Silvia Ferrari

January 2015 – May 2019

Cornell University, College of Engineering, Ithaca, NY

B.S. in Mechanical Engineering
Dean's List Fall 2012 – Spring 2014

August 2010 – May 2014

SPACECRAFT

HyTI, Hyperspectral Thermal Imager. Launched through the ISS and successfully communicated. December 2023

HIAPO, Hawaii's first community satellite. [Launched and exploded with Firefly Alpha](#) September 2021

Neutron-1, University of Hawaii cubesat measuring neutron flux. Launched through ISS. Beacons down information November 2020

KickSat-2, crowdfunded chip satellite cubesat. Launched through the ISS June 2019

Violet, Cornell high agility nanosatellite. Descoped at Pre-Ship Review December 2016

BOOKS

Zhu, F., "A Guide to CubeSat Mission and Bus Design". University of Hawai'i Pressbooks, 2022. ISBN 978-1-948027-11-3. <https://pressbooks-dev.oer.hawaii.edu/epet302/>.

JOURNAL PUBLICATIONS

- Zhu F.**, Jing D., Leve F., and Ferrari S. "NN-Poly: Approximating common neural networks with Taylor polynomials to imbue dynamical system constraints." *Frontiers in Robotics and AI* 9 (2022). doi: 10.3389/frobt.2022.968305
- Zhu F.**, Jones-Wilson L. and Peck M., "Reduced Embedded Magnetic Field in Type II Superconductor of Finite Dimension," in *IEEE Transactions on Applied Superconductivity* 30.6 (2020): 1-5. doi: 10.1109/TASC.2020.2976592
- Zhu F.**, Jones-Wilson L. and Peck M., "Flux-Pinned Dynamics Model Parameterization and Sensitivity Study," in *AIAA Journal of Information Systems*. doi: 10.2514/1.I010714
- Zhu F.**, Peck M., "Linearized Dynamics of General Flux-Pinned Interfaces," in *IEEE Transactions on Applied Superconductivity*. doi: 10.1109/TASC.2018.2844375
- Hopkins, B., **Zhu, F.**, Uncertainty Quantification & Sensitivity Analysis of Parameters Impacting Rover Dynamics, *in submission to Journal of Terramechanics*.
- Shriwastav, S., **Zhu, F.**, Online Dynamic Compressed Sensing for Unknown Flow Environments, *in preparation to Robotics and Automation Letters*.
- Jandial, P., **Zhu, F.**, Active Learning to Explore Acoustics of Underwater Environments with Autonomous Mobile Platforms, *in preparation to Robotics and Automation Letters*.

PEER-REVIEWED CONFERENCE PUBLICATIONS

- Hopkins, B., Hartzell, R., Paul, E., Hinkle, C., Yuroff, C., Dreyer, C., **Zhu, F.**, Rover Mobility in a Lunar Analogue Dataset, *accepted to International Space Robotics Conference*.
- Garcia, K., Yoshioka, M., Chen, H., Ray, T., Wang, T., **Zhu, F.**, "PolarTact3D: Single-shot Tactile 3D Shape and Color Sensing with Polarization Imaging", *Robotics: Science and Systems Navigating Contact Dynamics Workshop*, 2025. **3rd Place Best Paper Award**
- Mertens, H., **Zhu, F.**, "Comparative Analysis of Uncertainty Quantification Models in Active Learning for Efficient System Identification of Dynamical Systems", *International Conference on Automation Science and Engineering* 2024.
- Saito, J., Wang, H., **Zhu, F.**, "Portable Bevameter Design for Geotechnical Characterization on Planetary Surfaces", *in 2024 International Space Robotics Conference*.
- Kepa-Alama, K., de los Reyes, B., Tennebaum, A., **Zhu, F.**, "Planetary Localization in GPS-Deprived Environments with Open-Source Software and Commercial-Off-the-Shelf Components", *in 2024 International Space Robotics Conference*.
- Urasaki, C., **Zhu, F.**, Bottom, M., Nunes, M., Walker, A. "Jitter Analysis of the HyTI Satellite", *in 2024 IEEE Aerospace Conference Proceedings*. doi: 10.1109/AERO58975.2024.10521402
- Akemoto, A. and **Zhu, F.**, "Cooperative Lunar Surface Exploration using Transfer Learning with Multi-Agent Visual Teach and Repeat," *in 2023 IEEE Aerospace Conference Proceedings*. doi:10.1109/AERO55745.2023.10115696
- Akemoto, A. and **Zhu, F.**, "Informative Path Planning to Explore and Map Unknown Planetary Surfaces with Gaussian Processes," *in 2022 IEEE Aerospace Conference Proceedings*. doi: 10.1109/AERO53065.2022.9843742
- Zhu F.**, Elliott D.S., Yang Z., Zheng H., "Learned and Controlled Autonomous Robotic Exploration in an Extreme, Unknown Environment," *in 2019 IEEE Aerospace Conference*, 2019, pp. 1–10, doi: 10.1109/AERO.2019.8741552.
- Zhu F.**, Dominguez M., Jones-Wilson L. and Peck M., "Flight-Experiment Validation of the Dynamic Capabilities of a Flux-Pinned Interface as a Docking Mechanism," *in 2019 IEEE Aerospace Conference*. doi: 10.1109/AERO.2019.8742170
- Akins, S., Mertens, H., **Zhu, F.**, Cost-Aware Query Policies in Active Learning for Efficient Autonomous Robotic Exploration, *in submission to International Space Robotics Conference*.

NON-PEER-REVIEWED PUBLICATIONS

- Akins, S., Nakano, J., Matsumoto, R., Wang, H., **Zhu, F.**, "Field Demonstration of Gaussian Process Active Learning of Rover Mapping Spectral Composition in Hawaii's Lunar Surface Analog," *2024 Space Resources Roundtable Meeting*.

Witt, B., **Zhu, F.**, “TaRO-SCM: An Open-Source Terramechanics Simulation for Gazebo,” 2024 Space Resources Roundtable Meeting.

Akins, S., and **Zhu, F.**, “Comparing Active Learning Performance Driven by Gaussian Processes or Bayesian Neural Networks for Constrained Trajectory Exploration,” 2023 AIAA Accelerating Space Commerce, Exploration, and New Discovery (ASCEND) Conference.

Wang, H., Arroyo-Flores, K., and **Zhu, F.**, “Conducting Spectra-Spatial Investigations on the Big Island of Hawaii as a Lunar Surface Analogue,” 2023 AIAA Accelerating Space Commerce, Exploration, and New Discovery (ASCEND) Conference.

Sloan, A., Ngo, K., Amendola, C., Clements, L., Takushi, E., Imai-Hong, A., and **Zhu, F.**, “University of Hawaii’s Spaceflight-Ready, Low-Cost, Open-Source, Educational Artemis CubeSat Kit” in 2022 SmallSat Conference Proceedings.

Ngo, K., Sloan, A., Amendola, C., Clements, L., Imai-Hong, A., and **Zhu, F.**, “Project POKE (Providing Opportunities for Keiki in Engineering): Developing a STEM Community to Offset Learning Loss Amidst COVID Pandemic through Aerospace Technologies Project-Based Learning in Hawaii’s K-12 Classrooms” in 2022 SmallSat Conference Proceedings.

Bottom, M., Nunes, M., Liu, M., Claveau, C.A., **Zhu, F.**, Jacobson, S., Hodapp, K., Flynn, L., Zhang, X., Loose, M. and Ariyoshi, E. "Substellar Weather Infrared Explorer (SUWIE)." American Astronomical Society Meeting Abstracts. Vol. 54. No. 6. 2022.

Nunes, M., Bruhn, F., Wright, R., Lucey, P., Ferrari-Wong, C., Flynn, L., Pilger, E., Imai-Hong, A., **Zhu, F.** and Sorensen, T. "Hyperspectral Thermal Imaging CubeSat for SSA applications." 23rd Advanced Maui Optical and Space Surveillance Technologies Conference (AMOS), Maui, Hawaii, 27-30 September, 2022.

Janiszewski, H., Caplan, C., Chertok, M., Coats, S., McKenzie, T., Okuhata, B., Pietruszka, A., Ravanis, E., Shea, T., Tachera, D., **Zhu, F.**, “Huliāmahi: Overflowing of JEDI Efforts in the Earth Sciences at University of Hawai‘i at Mānoa”. American Geophysical Union (AGU) Fall 2021 Meeting.

Zhu, F., French, L., Schorghofer, N., Blachowicz, A., Li, S., Schurmeier, L., & Paton, M. (2021). Robot Technology Advancements for In-Situ Exploration of Subsurface Environments. Bulletin of the AAS, 53(4). <https://doi.org/10.3847/25c2cfeb.5193c523>

Zhu F., Jones-Wilson L. and Peck M., "A Concept for Capturing and Docking Spacecraft with Flux-Pinned Interfaces", in 67th International Astronautical Congress (IAC), Guadalajara, Mexico, 2016.

GRANTS & AWARDS

Total Funding as Principal Investigator (PI) or Faculty Advisor: \$2,277,497

\$1,923,997 (at UHM) + \$353,500 (at Mines)

Total Funding as Co-Investigator (Co-I or Co-PI) or Senior Personnel: \$21,794,636 (across all institutions) or

\$3,294,636 (to UHM directly)

PI, Mines Open Education Resources

July 2025 – December 2025

An Open-Source, Web-Browser Accessible Simulation for Robots on the Moon

Colorado School of Mines

Award Amount: \$4,000

PI, Mines Technology Fees

August 2025 – May 2026

1. Robots to Demonstrate Space Resource Operations on the Lunar Surface

2. Artemis CubeSat Development Kit for Student Capstone Project

Colorado School of Mines

Total Award Amount: \$9,500

PI, NASA Established Program to Stimulate Competitive Research

October 2021 – September 2024

Autonomous Rover Operations for Planetary Surface Exploration using Machine Learning Algorithms

University of Hawai‘i at Manoa

Grant Number: NNH21ZHA004C

Award Amount: \$750,000 USD

PI, NASA Minority University Research & Education Project

October 2022 – February 2023

An Open-Source, Comprehensive Robot Dynamics and Control ROS2 Simulation Environment for Planetary Surface Missions

University of Hawai'i at Manoa

Grant Number: 80NSSC22K1762

Award Amount: \$50,000 USD

PI, NASA Space Grant Artemis Student Challenge Opportunities

May 2020 – August 2022

Low-Cost Cubesat Kit and Course Development for Undergraduate Research Projects in the Public Domain

University of Hawai'i at Manoa

Grant Number: NNH20ZHA001O

Award Amount: \$750,000 USD

PI, NASA Space Technology and Research Fellow

August 2015 – May 2019

Close-Proximity Operations of Flux-Pinned Interfaces

Cornell University, Ithaca, NY

Grant Number: NNX15AP55H

Award Amount: \$296,000 USD

Co-I, NASA Established Program to Stimulate Competitive Research

October 2024 – September 2027

Cubesats for Climate Change Detection of Transient Greenhouse Gas Emissions

University of Hawai'i at Manoa

Award Amount: \$749,913 USD

Co-I, NASA MSI Partnership Grant

January 2023 – August 2023

Integrating Open-Source Ground, Flight, and Hardware Solutions for Space Exploration

University of Hawai'i at Manoa

Award Amount: \$40,000 USD

Co-I, Governor's Innovation Grant (GEER Grant)

August 2021 – July 2022

Building a Collaborative STEM Community Post-COVID

University of Hawai'i at Manoa

Award Amount: \$449,725 USD

Co-I, NASA Small Business and Innovation Research

January 2021 – May 2021

Additively Manufactured, Ultra-Stable RoboSiC Proximity Imaging CubeSat Telescope

University of Hawai'i at Manoa

Award Amount: \$5,000 USD

Co-PI, NSF ADVANCE Program

July 2022 – June 2024

The advancement of nā wāhine (women) and their intersectional experiences as STEM professionals at the

University of Hawai'i at Mānoa

Award: \$309,998 USD

Co-I, NASA Small Business Innovation Research

July 2022 – June 2024

Cooperative Control and Localization of Multiple Spacecraft using a Multi-Agent Mission Operations System

University of Hawai'i at Mānoa

Award Amount: \$280,000 USD

Senior Personnel, NSF Artificial Intelligence Institute: Dynamic Systems

August 2021 – July 2026

University of Washington

Total Award Amount: \$20,000,000 USD

Faculty Advisor, Summer Undergraduate Research Experience

May 2025 – August 2025

Space Robot Mobility Testing

Colorado School of Mines

Award Amount: \$4,000

Faculty Advisor, DoD SMART Fellowship

August 2025 – July 2029

Ryan Hartzell

Colorado School of Mines

Award Amount: \$336,000

Faculty Advisor, HSGC Internships and Traineeships

January 2021 – December 2022

Projects:

1. Integrating Hands-on Satellite Lab Modules for a Space Mission Design Course in the Public Domain

Updated December 2025

2. Survey and Design of Open Source Cube Satellite Structures
3. Parsimonious Kernels Underlying Gaussian Processes for Exploring Planetary Surfaces
4. Characterization of Soil Properties and Rover Dynamics with a Terramechanics System Identification Method, Model, and Simulation

University of Hawai'i at Manoa

Total Award Amount: \$18,000 USD

Faculty Mentor, Undergraduate Research

January 2022 – December 2022

Development and Implementation of Autonomous Rover Surveying Sensor Suite

University of Hawai'i at Manoa

Award Amount: \$9,997 USD

PRESENTATIONS AND PANELS

Speaker, "Rover Mobility Data in Colorado School of Mines' Lunar Analogue", Machine Ground Interaction Meeting September 2025

Speaker, "Autonomous Robots Traversing Extreme Environments", Colorado School of Mines NSF Research Experiences for Teachers. June 2025

Panelist, Authentically Me: Asian American and Pacific Islander Engineering Panel, Colorado School of Mines. April 2025

Panelist, Rapport Building for Your Career, Colorado School of Mines. March 2025

Host, University of Hawaii Kaulike Summit. October 2024

Speaker, "Autonomous Robots Traversing Extreme Environments", AIAA Space Resources Seminar. August 2024

Speaker, "Advancing kaulike (equity) focusing on STEM intersectional experiences at the University of Hawai'i at Mānoa (UHM)". ADVANCE Equity in STEM Community Convening. Baltimore, MD. June 2024

Host, Common Task Framework Workshop on behalf of the NSF AI Institute in Dynamic Systems, Manoa, Hawai'i. February 2024

Speaker, "Autonomous Robots Traversing Extreme Environments", Colorado School of Mines. February 2024

Speaker, "Autonomous Robots Traversing Extreme Environments", University of Washington. February 2024

Speaker, "Advancing Kaulike (equity) focusing on STEM intersectional experiences at the University of Hawai'i at Mānoa." American Geophysical Union Conference. San Francisco, CA. December 2023

Speaker, "Advancing Kaulike: Reflecting on Equity Considerations for the University of Hawai'i at Mānoa." National Diversity in STEM SACNAS Conference. Portland, OR. November 2023

Opening Remarks, Women in Machine Learning Reception, Honolulu, Hawai'i. July 2023

Keynote Speaker, Women in Data Science Hawai'i. April 2023

Speaker, "DEI Considerations for Benchmark Data Sets and Broadening Access" at the Common Task Workshop hosted by the NSF AI Institute of Dynamic Systems. February 2023

Speaker, "Autonomous Robots Traversing Extreme Environments", Institute for Astronomy Science Cafe, Manoa, Hawai'i. April 2023

Speaker, "University of Hawaii's Spaceflight-Ready, Low-Cost, Open-Source, Educational Artemis CubeSat Kit" at the 2022 SmallSat Conference. Logan, Utah. August 2022

Speaker, "Project POKE (Providing Opportunities for Keiki in Engineering): Developing a STEM Community to Offset Learning Loss Amidst COVID Pandemic through Aerospace Technologies Project-Based Learning in Hawaii's K-12 Classrooms" at the 2022 SmallSat Conference. Logan, Utah. August 2022

Speaker, "Informative Path Planning to Explore and Map Unknown Planetary Surfaces with Gaussian Processes," at 2022 IEEE Aerospace Conference. Big Sky, Montana. March 2022

Speaker, "Introducing Our Colleagues in Hawaii: Updates and Open Questions" speaker and "AI Education in the Sciences/Engineering" panelist at the NSF AI Institute for Dynamic Systems Kick-Off Meeting. Seattle, Washington. March 2022

Speaker, "Artemis Cubesat Kit: a Low-Cost, Spaceflight-Ready 1U Cubesat and Educational Materials in the Public Domain", NASA Space Grant Consortium. Jackson Hole, Wyoming. October 2021

Speaker, "Artemis Cubesat Kit: a Low-Cost, Spaceflight-Ready 1U Cubesat and Educational Materials in the Public Domain", NASA Exploration Science Forum & European Lunar Symposium. Virtual. July 2021

Speaker, "My Career Path as a Female, Aerospace Engineer", Ochanomizu University Senior High School and sister schools. Virtual. July 2021

Updated December 2025

Speaker, “Autonomous Robots Traversing Extreme Environments”, Electrical Engineering Department Seminar, Manoa, Hawai’i. April 2021

Keynote Speaker, VEX Robotics Tournament. Virtual. March 2021

Panelist, Society of Women Engineers Faculty. Virtual. February 2021

Panelist, Cornell SiGMA Job Search. Virtual. December 2020

Speaker. Singapore Space Challenge Seminar. Virtual November 2020

Speaker, “Autonomous Robots Traversing Extreme Environments”, Earth Science Department TGiF Seminar, Manoa, Hawai’i. September 2020

Speaker, “Autonomous Robots Learning Dynamics and Control in Extreme Environments” UH Manoa Inaugural Aerospace Engineering Seminar, Manoa, Hawai’i. September 2020

Speaker, Applied Research Lab Lightning Talks on Machine Learning and Autonomy, Hawai’i. July 2020

Panel Moderator, “Autonomous Systems”, Digileaders Conference, Stockholm, Sweden. November 2019

Speaker, "Genetic Algorithms for Autonomous, Learned Robotic Exploration in Extreme, Unknown Environments," IEEE Aerospace Conference, Big Sky, Montana. March 2019

Speaker, "Flight-Experiment Validation of the Dynamic Capabilities of a Flux-Pinned Interface as a Docking Mechanism," IEEE Aerospace Conference, Big Sky, Montana. March 2019

Speaker, “System Identification of Spaceflight Technology”, University of Minnesota Twin Cities. February 2019

Speaker, “System Identification of Spaceflight Technology”, University of Hawaii Manoa. February 2019

Speaker, “Contactless, Electromagnetic Interfaces for Spaceflight Operations”, University of Illinois Urbana Champaign. January 2019

Speaker, “Contactless, Electromagnetic Interfaces for Spaceflight Operations”, University of California San Diego. January 2019

Speaker, "Flux-Pinned Dynamics Model Parameterization and Sensitivity Study”, IEEE Aerospace Conference, Big Sky, Montana. March 2018

Speaker, Human-Tended Experiments in Microgravity Panel, Next-Generation Suborbital Researchers Conference, Broomfield, CO. December 2017

Speaker, NASA Technology Day on Capitol Hill, Washington D.C. June 2017

Speaker, “A Concept for Capturing and Docking Spacecraft with Flux-Pinned Interfaces”, 67th International Astronautical Congress, Guadalajara, Mexico. October 2016

Speaker, “Spacecraft Docking with Type II Superconductor Flux Pinning and Potential Energy Capture”, AIAA SciTech, San Diego, CA. January 2016

Speaker, “Computational Modeling to Represent Shoe Behavior in Multibody Movement Simulations”, Orthopedic Research Society Annual Meeting. January 2013

RESEARCH

Robotic Space Exploration Emphasizing Space Resources January 2025 – Present
Colorado School of Mines, Golden, CO

- Rover mobility testing and system identification
- Comprehensive regolith sensor suite to characterize geotechnical properties
- Rover perception and digital twin verification
- Rover dynamics system identification and planetary surface exploration through active learning

Robotic Space Exploration Leveraging Physics-Informed Machine Learning January 2018 – November 2024
UH Mānoa, Honolulu, HI

- Open-source, physics-derived terramechanics simulation for accurate rover state prediction
- System identification of rover dynamics through parameter estimation of physics-derived differential equations, sparse identification of nonlinear dynamics, and physics-informed neural networks
- Global localization on planetary surfaces using celestial reference points and gravity vector
- Data-driven exploration of planetary surfaces under constrained path planning
- Data-driven active learning for system identification of rover dynamics through experiment design
- Incorporating planetary science data and active learning to prospect south crater of Moon
- Extract dynamic information from an artificial neural network and guarantees outside of training scope
- Learned and controlled autonomous robotic exploration in an extreme, unknown environment

Contactless Spacecraft Docking Technology Development January 2015 – May 2019

Cornell University, Ithaca, NY & NASA JPL, Pasadena, CA

- General physics-based model framework for multi-degree of freedom flux-pinned system
- Design and demonstration of architecture for active, contactless spacecraft interaction
- Dynamics model system identification with empirical data from 4DOF air bearing tests and 6DOF microgravity tests using Bayesian filtering, neural networks, and evolutionary algorithms

Cryogenic Spacecraft Design

August 2016 – December 2016

Cornell University, Ithaca, NY

- Spacecraft concept study aimed toward deep space exploration through resilient power and thermal design

High Agility Nanosatellite Integration and Testing

August 2012 – December 2014

Cornell University, Ithaca, NY

- Created control moment gyroscope initialization and switching between steering laws, along with other attitude maneuvers to fulfill mission criteria
- Conducted software and hardware testing with AeroAstro Star Tracker, Blue Canyon Star Tracker, Sinclair Sun Sensor, and Goodrich magnetometer, including field and acceptance tests
- Helped integrate flight software and simulation for processor-in-the-loop tests, commanding and receiving actual hardware packets to mimic satellite communications during a day-in-the-life test

Star Scanner Development

June 2014 – August 2014

Goddard Space Flight Center, Greenbelt, MD

- Wrote and conducted detailed tests to assemble, calibrate, and gather telemetry from proof-of-concept of a new star scanner design
- Develop Lost-In-Space algorithm for filtering, data logic, and star identification
- Retrofitted autocollimator light source with modern lamps and recalibrated to simulate star light of similar spectra and intensity, precise to the 10^{-15} -Watt range

Mars-One Foundation

May 2013 – August 2013

Amersfoort, Holland

- Co-authored technical report of mission concept
- Market research on public opinion of Mars One

Flux Pinning Undergraduate Research

August 2011 – May 2012

Cornell University, Ithaca, NY

- Measured coarse spatial maps of magnetic field within superconductor
- Engineering trade studies and prototypes of insulation structure for superconductor-CubeSat integration

Musculoskeletal Biomechanics Research

May 2011 – August 2012

University of Missouri Kansas City, Kansas City, MO

- Created computational geometry and stiffness model for rubber sole of orthopedic shoe
- Measure stiffness and compliance of menisci for biomechanics model
- Generate menisci geometries from layered x-rays and dynamic gaits from Vicon camera data

STUDENTS ADVISED

PhD Chair	Master's Thesis	Undergrad: Rover (Mines)	Undergrad: Rover (UHM)	Undergrad: Flux Pinning (Cornell)
Bailey Hopkins	Kaiaka Kepa-Alama	Cameron Hinkle	Baylor de los Reyes	Sofya Calvin
Hans Mertens	Aksel Sloan	Charlie Yuroff	Christian Pak	Bhavi Jagatia
Sachin Shriwastav	Krystal Arroyo-Flores	Neel Jasti	Ashten Akemoto	Steven Liu
Ryan Hartzell	Kelly Ngo	Simon Igel	Bret Witt	Adler Smith
Abigail Glover	Chris Amendola	Owen Jeffcoat	Michael Mori	Ty Burney
Antar Mazumder	Prajna Jandial	Cameron Cox	Jacob Sequiera	Kate Zhou
PhD Committee	Sapphira Akins	Ira Mullins	Emma Stephan	Reginald Lin
Abigail Flom	Master's Project	Alex Robinson	Jeraldine Milla	Somrita Banerjee
Gregory Snyder	Dongheng Jing	Ainsley Soleta	Makenzie Cammack	Alexa Ditonto
Seth Stewart	Steven Dourmashkin	Sander Bouchard	Lynzee Hoegger	Harley Dietz
Eugene Hamzezadeh	Max Read	Luccas Barsotti	Stephanie Aelmore	Joyce Cao
	Eric Fiegel	Whitney Madler	Felisha Suela	Undergrad: Satellites (UHM)
	Mitchell Dominguez	Waylon Weeks	Deborah Higa	

Wesley Dixon
Travis Porter
Kevin Reed
Ethan Paul
Aidan Staszak
Lexi Hanlon
Rachel Cavalier
Ryan Manley
Enzo Urbani

Undergrad:
Satellites (Mines)
Vince Lucich

Faith Rolark
Jack Saito
Rona Lei Donaldo
Ethan Ibanez
Colbren Fujimoto
River Matsumoto

Katlynn Vicuna
Kalila Phillips
Regina Lee
Jessa Lamas
Adam Hu
Kalai Garcia
Christi Young
Evan Takushi
Kevin Williams
Mitchell
Matsumori-Kelly
Skyler Konno
Riley Terry
Danielle Young
Luke Clements

TEACHING & MENTORING EXPERIENCE

Technical Advisor for the Senior Design Teams

January 2025 – Present

Colorado School of Mines, Golden, CO

Mentor and technically advise interdisciplinary undergraduate student teams under the following topics:

1. Solar Sintering Lunar Rover
2. Bistatic Detection of Orbital Debris through CubeSats
3. University Rover Challenge

Sole Instructor for Spacecraft Robotics

August 2025 – October 2025

Colorado School of Mines, Golden, CO

SPRS 509: Instructed 28 graduate students about the fundamentals of space mission design related to space resources and robot subsystem design to fulfill mission objectives

Vertically Integrated Project Advisor for Robotic Space Exploration

August 2021 – November 2024

University of Hawai'i, Manoa, HI

Mentor and technically advise an interdisciplinary team of over 40 students of all university levels to compete in the University Rover Challenge

Directed Research

October 2020 – November 2024

University of Hawai'i, Manoa, HI

ME 699, 700 & EE 699, 700 & EE 699, 700: Mentor and technically advise graduate students

Lead and Co-Instructor for Spacecraft Bus Design

January 2021 – May 2024

University of Hawai'i, Manoa, HI

EPET/ME 400 & 401: Instructed over ~40 undergraduate students in spacecraft and testbed design, fabrication, integration, and data analysis as a part of the first Earth and Planetary Exploration and Technologies certificate

Research Team Lead

January 2015 – May 2019

Cornell University, Ithaca, NY

Guided over 20 undergraduate and master students in spacecraft and testbed design, fabrication, integration, and data analysis.

Teaching Assistant

January 2015 – May 2015

Cornell University, Ithaca, NY

MAE 5160: Spacecraft Technology and Systems Architecture

Satellite Subsystem Lead

January 2015 – December 2015

Cornell University, Ithaca, NY

Co-led the Attitude Controls and Sensing team of the most agile unclassified satellite, overseeing the integration attitude sensors and actuators, writing and testing flight software, and assigning/teaching tasks to 8 team members to meet ambitious, strict deadlines to secure a launch.

FIRST Technical Mentor

November 2017 – January 2018

Trumansburg, NY

Mechanical engineering technical mentor for a high school team of over 25 students

Ithaca High School Mentor Ithaca, NY Mentored high school team that won for their satellite concept to Escape Velocity Science Fiction Convention hosted by the Museum of Science Fiction	November 2017
InstaEdu Tutor Ithaca, NY Taught various mechanical engineering topics to college students through an online platform and presence	August 2014 – December 2015
SiGMA Mentor Cornell University, Ithaca, NY Offered guidance to first year Ph.D. students during transition	September 2016
Kumon Tutor Kumon, Overland Park, KS Taught math, science, and writing to students ranging from K-12 grade	May 2012 – August 2012
<u>SERVICE & OUTREACH</u>	
Women in Machine Learning Reception Honolulu, HI	August 2023
Women in Data Science Organizing Committee Honolulu, HI	April 2023
My Career Path as a Female, Aerospace Engineer Virtually in Tokyo, Japan Presented my career path to Ochanomizu University Senior High School and sister schools with over 100 students in attendance	July 2021
VEX Robotics tournament Keynote Virtually in Hawaii	March 2021
Society of Women Engineers Faculty Panel Virtually in Hawaii	February 2021
Cornell SiGMA Job Search Panelist Virtually in Ithaca, NY	December 2020
Singapore Space Challenge Seminar Virtually in Singapore	November 2020
4-H Career Exploration Workshop Ithaca, NY Co-led full day workshop for 25 students with a water bottle rocket design and build competition	June 2019
SSDS Lab Tours Ithaca NY Space Systems Design Studio tour guide, speaking about research advancements and facilities to students, visiting scholars, and industry partners, over 20 private tours and demos	January 2015 – May 2019
Society of Women Engineers Next Ithaca, NY Spacecraft presentation and Q&A Boynton middle school afterschool program	April 2019
Kid's Science Day Ithaca, NY Flux pinning interactive demonstration to over 200 children from elementary and middle school	April 2018
GALS Invited Speaker Denver, CO Spoke about my research and career path to over 100 girls ranging from middle school and high school	December 2017
JPL Women in STEM Los Angeles, CA Scientists and engineers speak and interact with high school girls from the Los Angeles school districts, over 250 in attendance	March 2017

Tech Savvy April 2016
Ithaca, NY
Series of technology related workshops for middle school girls, guided over 30 students

Expand Your Horizons April 2016
Ithaca, NY
Series of general science related workshops and demos for middle school girls, over 400 in attendance

Mathworks Workshop December 2014
Ithaca, NY
Organized a workshop in partnership with Mathworks to expose students to integrating MATLAB code onto microcontrollers and other software packages, over 50 in attendance

Science Center Flux Pinning Demo April 2013
Ithaca, NY
Demonstration of flux pinning phenomenon and liquid nitrogen ice cream to local families, geared towards elementary school children

ADVOCACY

Unlearning Racism in the Geosciences ([URGE](#)) Huliāmahi Pod January 2021 - Present
Manoa, HI
URGE's primary objectives are to (1) deepen the community's knowledge of the effects of racism on the participation and retention of Black, Brown, and Indigenous people in Geoscience, (2) draw on existing literature, expert opinions, and personal experiences to develop anti-racist policies and strategies, and (3) share, discuss, and modify anti-racist policies and strategies within a dynamic community network and on a national stage

Gender Equity Seminars March – April 2021
Manoa, HI
Organized two seminars centering Dr. Kelly Falkner's work within NSF to mitigate sexual harassment and a Picture a Scientist film panel discussion with HIGP and Earth Science Faculty members

All-Gender Restroom Renovation November – March 2021
Manoa, HI
Facilitated community discussion with Hawai'i Space Flight Laboratory about navigating the academy as Native Hawaiian students, who happen to also be first generation academics

Hawai'i Institute of Geophysics and Planetology Faculty Review Committee November 2020
Manoa, HI
Added diversity, equity, and inclusion activities to faculty review committee evaluation criteria

Navigating the Academy Discussion September 2020
Manoa, HI
Facilitated community discussion with Hawai'i Space Flight Laboratory about navigating the academy as Native Hawaiian students, who happen to also be first generation academics

Strike4BlackLives Discussion June 2020
Manoa, HI
Facilitated community discussion with Hawai'i Space Flight Laboratory about racial injustice

Journal Discussions about Sexism in the Academy May 2020
Virtual, Various Locations
Led community discussions with the University of Hawai'i Women in SOEST group, Hawai'i Space Flight Laboratory (co-ed), and Stanford's Women in AI Tea group

Ladies Tea Time August 2018 – December 2019
Ithaca, NY
Founded a community of graduate women to informally network. Since then, tea time has been financially backed and adopted by SiGMA, the graduate student organization for the Cornell Mechanical and Aerospace Engineering department.

[ADA LOVEFACE DAY](#) - Women in the Sciences Wikipedia Edit-a-thon October 2019
Ithaca, NY
In a bid to raise the profile of women in STEM, members of the Cornell and Ithaca community participated over the weekend in the Women in the Sciences' Wikipedia Edit-a-Thon

Intergroup Dialogue Project

July 2019

Ithaca, NY

Intimate, peer-facilitated sessions address topics of identity and communication while providing participants with the skills to engage in productive conflict and create new shared meanings

PROFESSIONAL AFFILIATIONS

IEEE Aerospace Conference, Executive Committee	July 2023 – Present
IEEE Member	June 2020 – Present
International Space Robotics Conference, Space Robotics Locomotion Session Chair	December 2025
Space Resources Roundtable Meeting, Robotics and Autonomy Session Chair	June 2024 – June 2025
International Space Robotics Conference, Executive Committee	September 2023 – August 2024
UH Search Advocate	August 2023 – November 2024
Graduate Women in Science Hawai'i	July 2020 – November 2024
Women in SOEST	January 2020 – November 2024
AIAA ASCEND, AI and ML Session Chair	October 2023
IEEE Aerospace Conference Robotic Mobility and Sampling Session Organizer	July 2022 – May 2023
Earth Science/HIGP JEDI Department Committee	August 2021 – August 2022
UH Mānoa WeLead Cohort	August 2021 – August 2022
Huliāmahi JEDI (UH Manoa Earth Science/HIGP DEI Grassroots Group)	August 2020 – August 2022
IEEE Aerospace Conference UAV Systems and Autonomy Session Organizer	August 2018 – March 2022
AIAA Student Member	January 2015 – August 2019
Association of Women in Science	June 2018 – August 2019
New York Academy of Sciences	June 2018 – August 2019
Cornell Graduate and Professional Student Mental Health Council	October 2018 – December 2019
Carl Sagan Institute	December 2018 – December 2019
Cornell University Colman Leadership Program	January 2018
Cornell University Next-Gen Professors	October 2017 – July 2018

MEDIA

Waymo self-driving cars are 'learning' Denver's streets. But Colorado has no regulatory oversight of autonomous vehicles. <https://www.denverpost.com/2025/11/09/waymo-denver-self-driving-cars/>

Buckle Up: Is Waymo Ready for Denver's Winter Roads and Angry Drivers? <https://www.westword.com/news/can-waymo-overcome-denver-winter-roads-angry-drivers-40790292/>

KTVD (MyTV) - 9News at 6PM Next With Kyle Clark segment about Autonomous Vehicle Testing in Denver <https://insight.tveyes.com/public/share/1a80e2ed-ea11-4c11-9f33-76d3a64b49fe/592e2639-a672-4abe-9b6f-190f08981dbe?tab=transcript>

Robot Talk Episode 127 – Robots exploring other planets: <https://www.robottalk.org/2025/10/03/episode-127-frances-zhu/>

Mars or Bust! UH Students' Robot Design Heads to International Showdown https://www.kitv.com/news/local/mars-or-bust-uh-students-robot-design-heads-to-international-showdown/article_3da3c05e-fa8d-11ee-914c-4317009a3644.html

NASA's Space Tech Prize Bolsters Diversity, Inclusivity Champions <https://www.nasa.gov/news-release/nasas-space-tech-prize-bolsters-diversity-inclusivity-champions/>

UH students, alumni, faculty win state innovation, entrepreneurship awards <https://www.hawaii.edu/news/2024/03/05/hvca-awards-2024/>

Cubesats, robotics, 3D printing: Hands-on STEM experience for HS students <https://www.hawaii.edu/news/2023/07/14/jesse-engineering-internship/>

Space exploration, AI engineering among selected UH startups <https://www.hawaii.edu/news/2023/02/28/hitide-cohort-2/>

#HotelMars: Robots and the future of space exploration. Frances Zhu, University of Hawaii <https://audioboom.com/posts/8133433-hotelmars-robots-and-the-future-of-space-exploration-frances-zhu-university-of-hawaii-david>

The Space Show: Dr. Frances Zhu <https://www.thespaceshow.com/guest/dr.-frances-zhu>

UH develops technology for future Artemis missions to Moon, Mars
<https://www.hawaii.edu/news/2022/11/15/tech-future-artemis-missions/>

A UH Incubator Aims to Take Ideas to Market
<https://www.hawaiibusiness.com/uh-incubator-hitide-innovation-hawaii-space-flight-laboratory/>

Office Of The Governor News Release: Governor Ige Invests \$8.1 Million in 31 Innovative Education Programs
<https://governor.hawaii.gov/newsroom/office-of-the-governor-news-release-governor-ige-invests-8-1-million-in-31-innovative-education-programs/>

From Aerospace to Agriculture, Grants to UH Programs tor COVID Responses, August 2021.
<https://www.hawaii.edu/news/2021/08/10/grants-programs-covid19-responses/>

NSF Partnerships Expand National AI Research Institutes to 40 States, July 2021.
https://www.nsf.gov/news/news_summ.jsp?cntn_id=303176

Artemis Cubesat Kit Mission Patch Tweet Getting Immense Attention, September 2020.
<https://twitter.com/Frankieequations/status/1309230391408996352>

StemWorks Student Internship Video, July 2020. <https://www.youtube.com/watch?v=faYfWgnUGA>

UH News and Pacific International Space Center for Exploration Systems Newsletter feature: UH Team Awarded \$500K by NASA to Develop CubeSat Kits for Students, June 2020.
<https://pacificspacecenter.com/2020/06/02/uh-team-awarded-500k-by-nasa-to-develop-cubesats-for-students/>
<https://www.hawaii.edu/news/2020/05/18/500k-develop-small-satellite-kits/>

Parabolic Flights Advance Space Technologies for Gesture Control, Propellant Gauging, and Mars Sample Return Capabilities, June 5, 2018.
<https://www.nasa.gov/centers/armstrong/features/parabolic-flights-advance-space-tech.html>

Cornell Graduate Student Spotlight, August 31, 2017, Vol. 2, No. 04.
http://cspot62-prod.engineering.cornell.edu/academics/student-spotlight.cfm?s_id=229

NASA Space Technology Research Fellowship, 2015 Awardees. <https://www.nasa.gov/feature/close-proximity-robotic-maneuvering-through-flux-pinning-manipulation>

Engineering their future: KU camp works to attract girls to science field, Lawrence Journal World, 2009.
<http://www2.ljworld.com/news/2009/jul/06/engineering-their-future-ku-camp-works-attract-girl/>

ABACUS Math Competition, 2002. <https://www.gcschool.org/page/shortcuts/abacus/abacus-international-hall-of-fame/frances-zhu?pending=true&cached=false>

TRAINING

Clean Room
 Electrostatic Discharge
 Hazard Waste Generation
 Hazard Communication
 Lunar Regolith Handling

Pressure Safety
 Personal Protective Equipment
 Respirator
 Cryogenic Handling
 Cybersecurity

COMPUTER SKILLS

Python
 Matlab
 Mathworks Simulink
 HTML/CSS (Basic)
 C++ (Basic)

ENGINEERING SOFTWARE

ANSYS
 Solidworks
 Autodesk Inventor
 STK
 FreeFlyer

MACHINERY

Mill
 Lathe
 Bandsaw
 3D Printer

SPORTS

Open Water PADI SCUBA Certification
 Rock Climbing
 Hiking
 Backpacking

LANGUAGES

English
Chinese

MUSIC

Flute
Piano