

CHRIS HAYNER

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🌐 Personal Website

in LinkedIn

🐙 Github

EDUCATION

Ph.D. in Aeronautical and Astronautical Engineering | **University of Washington**

📅 June 2026 (Expected)

Fellowships:

NASA Space Technology Graduate Research Opportunities (NSTGRO) Fellowship

Washington NASA Space Grant Fellowship

Co-Advised by Prof. Behçet Açıkmeşe and Prof. Karen Leung

BS in Applied Physics | **University of Washington**

📅 June 2021

Minor in Aeronautical and Astronautical Engineering

PUBLICATIONS

Journal Publications

[J1] Christopher R. Hayner, John M. Carson III, Behçet Açıkmeşe, Karen Leung, "Continuous Time Line-of-Sight Constrained Guidance for Six Degree of Freedom Systems," IEEE RA-L (In Review).

[J2] Kazuya Echigo, Christopher R. Hayner, Avi Mittal, Selahattin Burak Sarsılmaz, Behçet Açıkmeşe, Matthew Harris, "Linear Program Approach to Close Proximity Operation with Element-wise Quantized Control," IEEE L-CSS.

Conference Publications

[C1] Christopher R. Hayner, Natalia Pavlasek, John M. Carson III, Karen Leung, Behçet Açıkmeşe, "Information-Aware Powered Descent Guidance for Entry, Descent, and Landing Invited Session at AIAA Scitech 2025 Forum (Accepted).

[C2] Christopher R. Hayner*, Samuel C. Buckner*, Daniel Broyles, Evelyn Madewell, Karen Leung, Behçet Açıkmeşe, "HALO: Hazard-Aware Landing Optimization for Autonomous Systems," 2023 IEEE ICRA.

[C3] Kazuya Echigo, Christopher R. Hayner, Avi Mittal, Selahattin Burak Sarsılmaz, Behçet Açıkmeşe, Matthew Harris, "Convex Trajectory Planning for Proximity Operations using Electric Propulsion with Quantized Thrust," AIAA 2023-0493. AIAA Scitech 2023 Forum.

[C4] Daniel Broyles*, Christopher R. Hayner** Denotes equal contribution, Karen Leung, "WiSARD: A Labeled Visual and Thermal Image Dataset for Wilderness Search and Rescue," 2022 IEEE IROS.

[C5] Christopher R. Hayner, Timothy Zhou, Neil Gupta, Echo Liu, Parker Mayhew, and Juris Vagners. "Real-time Human Detection with integration of Visual and Thermal Data from High Altitude sUAS," AIAA 2021-0397. AIAA Scitech 2021 Forum.

Workshops

[W1] Natalia Pavlasek, Christopher R. Hayner, Sarah Li, Behçet Açıkmeşe, Meeko Oishi, and Claus Danielson. "Generating Blamelessly Optimal Control for Prioritized Constraint Sets," 2023 RSS Workshop: Towards Safe Autonomy: New Challenges and Trends in Robot Perception.

Symposium Presentations

[P1] Christopher R. Hayner, Echo Liu, Howard Peng, Parker Mayhew, Neil Gupta, Helen Kuni, Juris Vagners, "An Autonomous Machine Learning Approach to Search and Locate Operations," AIAA PNW Symposium 2020.

EXPERIENCE

Visiting Technologist | **NASA Johnson Space Center**

📅 Mar. - June 2024

📍 Houston, TX

- Developed Line-of-Sight guidance methods for entry, descent, and landing applications.

Graduate Research Assistant | **University of Washington**

📅 Dec. 2021 - Current

📍 Seattle, WA

- Participate in research across the Autonomous Controls Laboratory (ACL) and Control and Trustworthy Robotics Laboratory (CTRL).

Graduate Intern | **Air Force Research Laboratory**

📅 June - Sept. 2022

📍 Dayton, OH

- Worked on vision-based algorithms for alternative forms of navigation for autonomous systems.

Teaching Assistant | **University of Washington**

📅 Sept. - Dec 2021

📍 Seattle, WA

- **AA310 Orbital and Space Flight Mechanics:** Worked to develop homework assignments and exam problems for a class of >70 students.

- Held office hours, mentored students to think critically and logically about engineering problems.

Intern | **Applewhite Aero**

📅 June - Sept. 2021

📍 Seattle, WA

- Tested and tuned various UAV platforms. Integrated a variety of sensors and embedded computing payloads with computer vision algorithms onto UAV platforms. Assisted in the design of UAVs.

PROJECTS

Graduate Projects

Canted Quadrotor Design

- Designed and tested the quadrotor frame and all other physical components in CAD
- Designed the custom circuit board schematic and layouts and integrated with NVIDIA Orin NX and Raspberry Pi Compute 4 Module processors
- Performed system identification to model actuator dynamics
- Implemented and tuned higher-order loop-shaped cascaded controllers and allocator

Perception-Aware Trajectory Planning [J1], [C1], [C2]

- Formulated and implemented a Sequential Convex Programming-based trajectory planning method which ensures keypoints or landmarks, commonly used in many perception algorithms, are kept within the LoS of a sensor throughout robot movement.
- Designed a tightly coupled perception and planning systems to determine safe landing sights and plan robust contingency-aware trajectories to them. A video demonstration can be found [here](#).
- Implemented successive convex programming (SCP) to solve for a control trajectory.

Real-time optimization based trajectory planning for spacecraft [J2], [C3], Article: *Tugs in Space*

- Formulated and implemented real-time convex optimization methods to compute trajectories for spacecraft rendezvous, proximity operations and docking with electric propulsion subject to quantized thrust constraints.

Undergraduate Projects

Wilderness Search and Rescue [C4], [C5], [P1] Article: *Hide and Seek: Training a drone to save lives*

- Created and compiled a large visual and thermal dataset for human identification in a wilderness environment.
- Used a variety of computer vision algorithms to train models.
- Tested models on UAV platforms using onboard- and ground-based computing for inference on live thermal and visual imagery.

Aerial Mapping of Fire Behavior

- Created orthomosaic maps and point clouds of land utilizing visual and SWIR UAV based photogrammetry for calculating biomass to predict wild fire propagation.

Drone-based Air Quality Surveys, Article: *Can Trees Clean Jet Pollution*

- Integrated drone-mounted sensors to detect pollutants near SeaTac airfield and surrounding highways.

Ground Penetrating Radar, Article: *Peering into Snow*

- Integrated large GPR payloads as well as RTK GNSS onto UAV with the goal of remotely sensing and mapping snow depth.

MENTORSHIP

Masters Students

Aman Tiwary (MS in Mechanical Engineering at the University of Washington)

Christopher Sota (MS in Mechanical Engineering at the University of Washington)

Undergraduates

Annika Singh (Now an Intern at Goldman-Sachs)

Avi Mittal (Now a Ph.D. student at the University of Washington) - Publications [C3], [J2]

High School Students

Neil Gupta (Now an Undergraduate at University of Massachusetts Amherst) - Publication [C5]

Timothy Zhou (Now an Undergraduate at University of Illinois Urbana-Champaign) - Publication [C5]

Saket Gollapudi (Now an Undergraduate at University of Washington Seattle)

PUBLIC OUTREACH

UW Women of Aerospace

📅 2022 - Current

Worked to expand women's opportunities for leadership and increase their visibility in the aerospace community through mentorship and outreach activities.

UW Discovery Days Volunteer

📅 2019 - Current

Set up interactive stand for 4th - 8th graders which showed off my lab's current research projects in an effort to increase students' interest in STEM.

SKILLS

General: Convex Optimization, Dynamics Modeling and System Identification, Simulation, Geometric Modeling

Programming Languages: MATLAB, Python, Julia, C/C++

Frameworks and Libraries: Pytorch, CVX, OpenCV

Operating Systems: Linux, MacOS, Windows

Software: ROS, Solidworks, Unreal Engine, Adobe Suite, Optitrack Motive

Hardware: Embedded Systems (NVIDIA Jetson, Raspberry Pi, STM32 Microprocessor), SLA and FDM 3D Printing, Soldering, Motion Capture, Servers

AWARDS AND FELLOWSHIPS

AA Student Excellence Award for Doctoral Research

📅 2023

1st Place Poster - UW Graduate Research Showcase

📅 2023

REFERENCES

Behçet Açıkmüşe

Position: Professor, Aeronautics and Astronautics Department, University of Washington

Relationship: Ph.D. Co-Advisor, Autonomous Controls Laboratory PI

Email: behcet [at] uw [dot] edu

Karen Leung

Position: NVIDIA Research Scientist Autonomous Vehicles; Assistant Professor, Aeronautics and Astronautics Department, University of Washington

Relationship: Ph.D. Co-Advisor, Control and Trustworthy Robotics Laboratory PI

Email: kymleung [at] uw [dot] edu

Juris Vagners

Position: Professor Emeritus, Aeronautics and Astronautics Department, University of Washington

Relationship: Undergraduate Advisor, Autonomous Flight Systems Laboratory PI

Email: vagners [at] uw [dot] edu

David Shean

Position: Assistant Professor, Civil and Environmental Engineering Department, University of Washington

Relationship: Undergraduate Advisor, Terrain Analysis and Cryosphere Observation Laboratory PI

Email: dshean [at] uw [dot] edu