

David Brown

Applied Mathematician & Chief of Staff

✉ david@davidcalebbrown.com 📞 251-518-0543 📍 Denver, CO
🌐 davidcalebbrown.com 🔗 linkedin.com/in/davidcalebbrown 🐙 github.com/Davidb8

Summary

I develop intelligent navigation systems and mathematical models for high-altitude balloons and aerospace applications, combining theoretical mathematics with practical engineering solutions. Currently serving as Chief of Staff at Urban Sky while completing dual degrees at Harvard.

Education

Harvard University

M.S. Applied Mathematics (Aerospace Engineering/Machine Learning)

Cambridge, MA

Expected May 2025

- GPA: 3.945/4.0 (Major GPA: 4.0)
- Honors: Magna Cum Laude with Highest Honors in Applied Mathematics
- HBS Fellowship: Roberts Family / Technology Innovation Fellow
- Awards: John Harvard Scholarship Award (2022), Thomas T. Hoopes Thesis Award (2025)

Harvard University

B.A. Applied Mathematics, Secondary in Astrophysics

Cambridge, MA

Expected May 2025

- Relevant Coursework: Machine Learning, Optimal Control Theory, Space Systems Engineering, Signal Processing, Fourier Analysis, Differential Equations, Engineering Data Analytics

Experience

Urban Sky

Chief of Staff

Denver, CO

May 2025 – Present

- Ensure timely completion of all company goals and objectives
- Continue leadership over balloon navigation research and development

Simulations Engineer

November 2022 – May 2025

- Conducted scientific studies into trends in wind behavior, historical shifts, and forecasting accuracies
- Managed small team in development of several multimillion-dollar AFWERX/SBIR government contracts
- Developed high fidelity model of balloon system operating in a chaotic and dynamic 3D space
- Leveraged Optimal Control Theory to develop AutoPilot system to intelligently navigate transitions of complex nonlinear dynamic systems in real-time environments
- Started Machine Learning Sector for controlling balloons using classical ML and reinforcement learning
- Leading business development opportunities for humanitarian and sustainable development

Simulations and Modeling Intern

May 2022 – November 2022

- Modeled balloon flight behavior by creating custom simulator
- Created tool for analyzing flight viability of any location in the US based on wind and geographical conditions
- Government contracting support (Phase 1 and 2) for proposal development and research

Maxar

Aerospace Engineering Analyst Intern

Herndon, VA

June 2023 – August 2023

- Simulation and Modeling team tasked with enabling space agents to make intelligent decisions in complex environments

- Developed tools for fully customizable space-based simulator including high fidelity multibody transfer, satellite-based observation and communication, and Kalman Filter based predictions
- Implemented optimization algorithms to solve complex orbital transfers with up to 60% reductions in fuel costs
- Leveraged Machine Learning to eliminate costly planning procedures, achieving 98% faster flight planning
- Presented work to over 200 Applied Machine Learning experts

Research

Stratospheric Station Keeping Study

Advisor: Professor Marianna Linz

Harvard University

January 2023 – Present

- Collaborated with Urban Sky to model general zero-pressure balloon behavior over extended flight durations
- Created algorithm to determine altitude adjustment decisions to keep balloons over a target region
- Mass simulation using ERA5 Wind Data to identify major trends behind global viability of navigation
- Investigating applications to deforestation monitoring in Amazon Rainforest and wildfire prevention in Australia

Incorporating Imperfect Information via Attention for Learning

Advisor: Professor Demba Ba

Harvard University

May 2024 – Present

- Devised framework to differentiate ground truth from imperfect information in machine learning
- Applied framework to balloon navigation to develop state-of-the-art controller
- Implementing model for use on real high-altitude balloons; seeking provisional patent

Publications

- **Brown, D.**, Linz, M., Leidich, J. “Seasonal and geographic viability of high altitude balloon navigation.” *Nature Scientific Reports*, 2024. [doi:10.1038/s41598-024-71445-9](https://doi.org/10.1038/s41598-024-71445-9)
- **Brown, D.**, et al. “Optimizing operating altitudes of high altitude balloons for navigation.” *Nature: Communications Earth & Environment*, 2024. (In Review)
- **Brown, D.**, et al. “Flight Safety of launching a high altitude balloon through airspace.” Preprint, 2024.

Skills

Languages: Python, C, Java, MATLAB, Arduino, Git

Software: ArcGIS, PyTorch, TensorFlow, STK, GMAT, QGIS, CAD, CATIA Cameo

Technical: Microcontrollers, 3D Printing, Milling, Laser Cutting, Machine Shop

Activities & Leadership

- Harvard Students for Exploration and Development of Space
- Harvard Rocket Propulsion Group Lead
- Harvard Space Law Society
- Space Generation Advisory Council
- Student Astronomers at Harvard-Radcliffe
- Harvard Peer Advising Fellow
- Fine Art, Astro, & Underwater Photography
- Eagle Scout (2019)