

David Brown

Applied Mathematician & Chief of Staff

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Education

Harvard University

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

Cambridge, MA

Expected May 2025

Harvard University

B.A. Applied Mathematics, Secondary in Astrophysics

Cambridge, MA

Expected May 2025

- Magna Cum Laude with Highest Honors in Applied Mathematics
- Relevant Coursework: Machine Learning, Optimal Control Theory, Space Systems Engineering, Signal Processing, Fourier Analysis, Differential Equations, Engineering Data Analytics

Professional & Research 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

Harvard University – Stratospheric Station Keeping Study

Advisor: Professor Marianna Linz

Cambridge, MA

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

Harvard University – Imperfect Information via Attention for Learning **Cambridge, MA**
Advisor: Professor Demba Ba *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.

Honors, Awards, and Fellowships

- **Thomas T. Hoopes Thesis Award** – Harvard University, 2025
- **Roberts Family / Technology Innovation Fellow** – Harvard Business School, 2024
- **John Harvard Scholarship Award** – Harvard University, 2022
- **Eagle Scout** – Boy Scouts of America, 2019

Talks & Presentations

- **Machine Learning for Space Operations** – Maxar Applied ML Summit, August 2023. Presented to over 200 machine learning experts.

Projects

- **Balloon Navigation Simulator** – Built high-fidelity simulation environment for testing stratospheric balloon navigation algorithms using ERA5 wind data
- **AutoPilot System** – Developed optimal control-based autopilot for real-time balloon navigation in chaotic atmospheric conditions

Skills & Interests

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
Leadership: Harvard SEDS, Harvard Rocket Propulsion Group Lead, Space Generation Advisory Council
Interests: Fine Art Photography, Astrophotography, Underwater Photography