Brandon Apodaca

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Education

University of Michigan, College of Engineering — Ann Arbor, MI
PhD, Robotics. GPA 3.88 — Expected Graduation May 2026

University of Michigan, College of Engineering — Ann Arbor, MI
MS, Robotics. GPA 3.86 — Graduated April 2023

Harvey Mudd College — Claremont, CA
BS, Engineering. GPA 3.74 — Graduated May 2021

Study Abroad: Peking University — Beijing, China
Analog Electronics, Chinese Language, Chinese Culture. — June 2018 – August 2018

Work/Project Experience

A2Sys Lab & Stirling Lab — Ann Arbor, MI
PhD Candidate — September 2021 – Present

- Designed and implemented a gaze estimation algorithm leveraging Bayes' theorem.
- Designed and Implemented a novel global path planner for zero gravity called Rapidly-exploring Random Trees for Zero-gravity (RRTZ) in Python, C++, and CUDA.
- Designed and conducted simulated experiments analyzing the effect of gravity on proximity operation trajectories generated by RRTZ.
- Designed and implemented a complete coverage path planner for inspections of large complex space structures leveraging RRTZ, CUDA raytracing, an extended traveling salesman problem formulation, and IPOPT.
- Designed a human subject study with IRB proposal testing the effect of inspection trajectory generation algorithm on situation awareness and inspection performance.

Electromagnetic Systems Inc. — El Segundo, CA
Machine Learning Engineer — June 2021 – August 2021

- Designed and implemented a false positive detector using computer vision techniques in a shared codebase in Python leveraging git.

De Pietro Fellowship — Claremont, CA
Research Fellow — December 2018 – May 2021

- Conducted impulsive vibration tests on Bluestone Dam and the Oroville Spillway.
- Developed and implemented tools to non-destructively and non-invasively monitor the tension in post-tensioned anchors in large concrete dams.
- Presented health monitoring recommendations developed from the analysis of vibration testing results and tension monitoring tools to the Department of Water Resources of California.
- Wrote, submitted, and presented papers at the United States Society on Dams conference.

Millennium Space Systems — Claremont, CA
Team Lead — September 2020 - May 2021

- Designed software for subpixel object movement analysis and displacement estimation.
- Lead and facilitated weekly presentations and final deliverables (report, presentation, design prototype).

Meggitt Ltd — Claremont, CA
Undergraduate Student — September 2019 - December 2019

- Designed and tested a smoke detector network for use in commercial aircraft.

Final Projects: Logo detection and replacement in videos via diffusion, smoking classificaiton on PATH ICPSR datal

Skills & Interests

Technical Skills: MATLAB, Python, C, C++, C#, CUDA, LaTeX, Git, GPower, Unity.
Leadership Experiences: Tau Beta Pi tutor, Robotics Graduate Student Council GSAC Representative, Robotics Graduate Student Council Social Chair, Undergraduate Clinic Team Lead.
Interests: Trajectory Optimization, Structural Inspection Path Planning, Coverage Path Planning, Human Supervised Inspection Planning, Trajectory Generation for Human Supervised In-orbit Inspection.

Conferences and Presentations

[1] **B. Apodaca**, T. Helgeson, Atkins, E., and Stirling, L., "In-Orbit Space Structure Inspection Trajectory Generation,"in review.

[2] **B. Apodaca**, L. Stirling, E. Atkins. Michigan Space Grant Consortium Fall 2024 Conference: In-Orbit Structure Inspection Trajectory Generation.

[3] **B. Apodaca**, E. Atkins, L. Stirling. (2024). IEEE Aerospace 2024: RRTZ: a Path Planner Designed for Zero Gravity.

[4] **B. Apodaca**, Atkins, E., and Stirling, L., "Orbital Dynamic Effects on Fuel Use in Sampling-based Plans for Proximity Operations,"in review. Nov 2023.

[5] **B. Apodaca**, E. Atkins, L. Stirling. (2023). IROS 2023: Effect of Orbital Dynamics on Fuel Use in Sampling-based Plans for Proximity Operations.

[6] H. Weiss et al., “Methods for Evaluation of Human-in-the-Loop Inspection of a Space Station Mockup Using a Quadcopter,” in 2022 IEEE Aerospace Conference (AERO), Mar. 2022, pp. 1–12. doi: 10.1109/AERO53065.2022.9843466.

[7] **B. Apodaca**, C. Lau, F. Kopp, D. Contreras, and Z. Duron, (2021). USSD 2021: Simplified Approach for Seismic Predictions of a Concrete Dam Based on Narrow Band Behavior

[8] A. Pham et al., “A Practical Implementation of the Performance Based Evaluation of Post-Tensioned Anchors in Concrete Dams,” in 2020 USSD Conference and Exhibition, Denver, CO: The United States Society on Dams, Apr. 2020. [Online]. Available: https://ussd.conferencespot.org/2020/pdf/2020a110/03600531000044

[9] **B. Apodaca**, A. Pham, D. ShangGuan, F. Xia, C. Yang. (2019). Performance Based Post-Tensioned Anchor Condition Assessment.

Honors and Awards

De Pietro Fellowship, Harvey Mudd College — December 2018 – May 2021
Rackham Merit Fellowship, University of Michigan — August 2021 - Present