# Liam Robinson – *Curriculum Vitae*

robin502@purdue.edu
Lafayette, IN | (704) 998-8906

## Research Interests

Space situational awareness, space object characterization, inverse problems, high-performance computing, optical satellite photometry, space debris laser ranging

## Education

**Purdue University** – West Lafayette, IN

*Ph.D. Aeronautical and Astronautical Engineering* (4.0 GPA) — Expected May 2027
Thesis: "Attitude and Shape Characterization for Space Objects using Light Curves and Laser Ranging"
Advisor: Carolin Frueh

*MS Aeronautical and Astronautical Engineering* (4.0 GPA) — Dec 2023
Thesis: "Light Curve Simulation and Shape Inversion for Human-Made Space Objects"
Advisor: Carolin Frueh

*BS Aeronautical and Astronautical Engineering* (4.0 GPA) — Dec 2022

## Fellowships & Awards

- Best Graduate Presentation at the Purdue Aeronautics and Astronautics Symposium | $500 — 2025
- National Defense Science and Engineering Graduate Fellowship (NDSEG) | $142,000 — 2023 – 2026
- NSF Graduate Research Fellowship (GRFP) | $111,000 (declined) — 2023
- NASA National Space Technology Graduate Research Opportunity (NSTGRO) | $150,000 (declined) — 2023
- 3rd Place Graduate Presentation at the Purdue Aeronautics and Astronautics Symposium | $200 — 2023
- Best Research Talk at the Purdue Undergraduate Research Conference | $500 — 2022
- Best Interdisciplinary Research at the Purdue Undergraduate Research Conference | $100 — 2022
- Best Undergraduate Presentation at the Purdue Aeronautics and Astronautics Symposium | $150 — 2022
- AAE General Scholarship | $5000 — 2022
- J. M. Umbreit Scholarship | $5500 — 2020 – 2022

## Peer-Reviewed Publications

[6] Burke, P. A., Ehlmann, B. L., Steckel, A. V., Masiero, J., Fajardo-Acosta, S., Lazio, T. J. W., Strauss, R., Brozovic, M., Trilling, D., **Robinson, L.**, Lantoine, G., Klima, R., "Determination of Lunar Trailblazer's Spin State using Ground-Based Optical and Radar Observations". In: *Earth and Space Science* (2025). Submitted to The Lunar Trailblazer Mission Collection.

[5] Ehlmann, B., Bellerose, J., Lantoine, G., Furlan, E., Scire, E., Fajardo-Acosta, S., Bennett, L., Sanchez Net, M., Lazio, T. J. W., Brozovic, M., Masiero, J., Steckel, A. V., Burke, P. A., Kimura, M., Foxman, S., Zaw, M. P. M., Lee, L. M., Clarke, F., Hauge, M., McDonald, D., Adler, J., Strauss, R., Trilling, D., Edwards, C. S., Nolan, M. C., Lyster, D., **Robinson, L.**, Klesh, A. T., Seybold, C. C., "Lunar Trailblazer Spacecraft Tracking and Mission Recovery Attempt: Characterization of Status and Behavior of a Non-Cooperative Object in Cis-Lunar Space". In: *Earth and Space Science* (2025). Submitted to The Lunar Trailblazer Mission Collection.

[4] **Robinson, L.**, Frueh, C., "A CCD/CMOS Telescope Digital Twin for Space Situational Awareness". In: *Advances in Space Research* 76.5 (2025), pp. 3074–3097. DOI: https://doi.org/10.1016/j.asr.2025.06.053.

[3] **Robinson, L.**, Frueh, C., "Global Light Curve Attitude Estimation With Noisy Measurements and Inertia Uncertainty". In: *Journal of Astronautical Sciences* (2025). Submitted for review.

[2] **Robinson, L.**, Steckel, A., Frueh, C., Ehlmann, B., "Lunar Trailblazer Attitude Inversion from Ground-Based Light Curves with Material Sensitivity Analysis". In: *Earth and Space Science* (2025). Submitted to The Lunar Trailblazer Mission Collection.

[1] Burton, A., **Robinson, L.**, Frueh, C., "Light curve attitude estimation using particle swarm optimizers". In: *Advances in Space Research* (2024). DOI: https://doi.org/10.1016/j.asr.2024.09.008.

## Conference Proceedings

[5] **Robinson, L.**, Frueh, C., "Optimal Light Curve Attitude Inversion with Measurement Noise: Two Case Studies". In: *Proceedings of the 9th European Conference on Space Debris*. European Space Agency. Bonn, Germany, Apr. 2025.

[4] Burton, A., **Robinson, L.**, Frueh, C., "Attitude Estimation Using Light Curves: A Particle Swarm Approach". In: *AIAA SciTech 2024 Forum*. 2024.

[3] Burton, A., **Robinson, L.**, Frueh, C., "Attitude Estimation from Scratch for Human-Made Objects Using Light Curves". In: *The Second International Orbital Debris Conference*. 2023.

[2] Frueh, C., Burton, A., Kobayashi, D., **Robinson, L.,** "Space Object Characterization from Light Curves". In: *Proceedings of the 44th COSPAR Scientific Assembly*. July 2022.

[1] **Robinson, L.**, Frueh, C., "Light Curve Inversion for Reliable Shape Reconstruction of Human-Made Space Objects". In: *Proceedings of the 32nd AIAA/AAS Astrodynamics Specialist Conference*. Sept. 2022, pp. 1–19.

## Working Papers

[2] **Robinson, L.**, Frueh, C., "A High-Fidelity Measurement Model for Space Debris Laser Ranging". In: *2026 AIAA/AAS Astrodynamics Specialist Conference*. July 2026.

[1] **Robinson, L.**, Frueh, C., "Simultaneous Shape and Attitude Characterization for Space Debris with Light Curves and Laser Ranging". In: *2026 AIAA/AAS Astrodynamics Specialist Conference*. July 2026.

## Symposiums & Presentations

[4] "Optimal Light Curve Attitude Inversion with Measurement Noise: Two Case Studies". In: *AAE Research Symposium, Purdue University*. 2025.

[3] "Modeling and Observation Processing for Advanced Shape and Attitude Estimation". In: *University of Bern, Switzerland*. 2024.

[2] "Light curve inversion for shape reconstruction of human-made space objects". In: *AAE Research Symposium, Purdue University*. 2023.

[1] "Non-Convex Shape Inversion from Light Curves". In: *AAE Research Symposium, Purdue University*. 2023.

## Research Experience

**Space Information Dynamics Group** – Graduate Research Assistant Oct 2021 – Present

- Designing novel space object characterization algorithms under Dr. Carolin Frueh, estimating shape and orientation of human-made space objects from unresolved optical observations
- Introduced new light curve inversion algorithms to estimate non-convex shapes and complex spin profiles
- Collaborated with Ph.D. students on relative pose estimation and filter design for attitude estimation
- Primary operator of the Purdue Optical Ground Station telescope for optical image collection and processing

**Astronomical Institute, University of Bern, Switzerland** – Visiting Ph.D. student May 2024 – Aug 2024

- Worked with Dr. Thomas Schildknecht's group on image acquisition and processing for satellite characterization
- Validated digital twin model for optical telescopes against imagery acquired by the Zimmerwald Observatory

## Teaching & Mentoring Experience

- Produced 180 exam review videos covering undergraduate engineering math courses (2019 – 2021), viewed by Purdue students over 1,000,000 times as of November 2025 through the Boilerexams project.

- Mentored 22 undergraduate engineering student volunteers with Boilerexams (2023 – present) on producing exam review lectures for fellow Purdue students. Led meetings to develop consistent and effective pedagogy based on feedback from students, faculty, and administration. Mentees have created 150 hours of video across 20 introductory STEM courses as of November 2025, viewed by Purdue students over 750,000 times.

## Industry Employment

**The Aerospace Corporation** | Graduate Astrodynamics Intern — May 2023 – Aug 2023
**Katalyst Space Technologies** | Guidance, Navigation, and Control Intern — May 2022 – Aug 2022
**Analytical Graphics, Inc.** | Systems Engineering Intern — Jan 2021 – May 2021

## Professional Service

- Referee: *Journal of the Astronautical Sciences*

## Academic Outreach

**Founder of Boilerexams.com** — Aug 2019 – Present

- Led team of 20 students to develop and maintain website to provide exam studying resources to fellow Purdue students with 9,400,000 questions answered as of November 2025
- Interfaced with College of Engineering administrators, University Vice Provosts, and member of the University Board of Trustees to support STEM retention objectives
- Initiated the founding of similar organizations under development at five other universities

## References

- Carolin Frueh
  Harold DeGroff Associate Professor of Aeronautics and Astronautics
  Purdue University
  cfrueh@purdue.edu, (765) 494-7436