

RUTHVIK BOMMENA

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EDUCATION

University of Illinois Urbana-Champaign (UIUC)

Ph.D. Aerospace Engineering

Aug 2023 – Expected Dec 2026

M.Sc. Aerospace Engineering

Aug 2021 – May 2023

University of Illinois Chicago (UIC)

B.Sc. Mechanical Engineering

Aug 2017 – May 2021

Institute of Aviation at Parkland College

Private Pilot License

Aug 2022 – May 2023

JOURNAL PUBLICATIONS

- H. Panag, **R. Bommena**, R. Woollands, "Thruster Pointing Constrained Fuel Optimal 6-DOF Proximity Operations using Indirect Methods," *The Journal of the Astronautical Sciences*, 2026. [10.1007/s40295-026-00572-4](https://doi.org/10.1007/s40295-026-00572-4)
- **R. Bommena** and R. Woollands, "Path-Constrained Optimal 6-DOF Motion for Multi-Agent In-space Servicing and Assembly," *Acta Astronautica*, 2025. [10.1016/j.actaastro.2025.08.052](https://doi.org/10.1016/j.actaastro.2025.08.052)
- **R. Bommena** and R. Woollands, "Indirect Trajectory Optimization with Path Constraints for Multi-Agent Proximity Operations," *The Journal of the Astronautical Sciences*, 2024. [10.1007/s40295-024-00470-7](https://doi.org/10.1007/s40295-024-00470-7)
- A. Pascarella, **R. Bommena**, S. Eggl, and R. Woollands, "Mission Design for Space Telescope Servicing at Sun-Earth L2," *Acta Astronautica*, 2024. [10.1016/j.actaastro.2024.08.031](https://doi.org/10.1016/j.actaastro.2024.08.031)

CONFERENCE PRESENTATIONS

- **R. Bommena** and R. Woollands, "LOS-Aware Beacon Placement for Robust Relative Navigation for Spacecraft Proximity Operations," *AAS Guidance, Navigation and Control Conference*, 2026.
- H. Panag, **R. Bommena**, and R. Woollands, "Thruster Pointing Constrained Optimal 6-DOF Proximity Operations using Indirect Optimization," *AAS/AIAA Astrodynamics Specialist Conference*, 2025.
- **R. Bommena**, H. Panag, and R. Woollands, "Optimal 6-DOF Control Strategies for In-Space Servicing and Assembly Missions at Sun-Earth L2," *AAS Guidance, Navigation and Control Conference*, 2025.
- **R. Bommena** and R. Woollands, "Path-Constrained Optimal 6-DOF Motion for Multi-Agent In-space Servicing and Assembly," *AAS/AIAA Space Flight Mechanics Meeting*, 2025.
- **R. Bommena** and R. Woollands, "Fuel-Optimal Multi-Agent Operations with Path Inequality Constraints," *AAS/AIAA Astrodynamics Specialist Conference*, 2024.

WORK EXPERIENCE

Graduate Research Assistant, Dept. of Aerospace Engineering UIUC, Champaign, Illinois

Aug 2023 – Present

- Developing advanced guidance, navigation, and control (GNC) algorithms for autonomous spacecraft rendezvous, proximity operations, and in-space servicing missions, as part of the research conducted in the Computation, Optimization, Simulation, and Modeling of Orbiting Spacecraft ([COSMOS](#)) laboratory.
- Design and analyze trajectory optimization methods, including path-constrained 6-DOF maneuver planning for multi-agent spacecraft systems, with emphasis on safety, precision, and fuel efficiency.
- Implement and validate indirect optimal control techniques for multi-agent systems, addressing critical path inequality constraints such as thruster-pointing constraints to prevent plume contamination of sensitive instruments of target spacecraft and implementing anti-collision measures for swarm safety.

Flight Dynamics Intern, Indian Space Research Organisation, Bengaluru, India

May 2025 – July 2025

- Developed an optimal impulsive trajectory design framework for Earth-return missions from lunar orbit, at ISRO's U R Rao Satellite Centre.
- Developed custom MATLAB/Python tools to compute minimum ΔV transfers, using optimal control theory and nonlinear programming, while enforcing lunar-departure, Earth-reentry, and dynamical constraints.
- Executed a year-long search for 2027 to find optimal return windows, delivering validated solution sets that support mission planning for ISRO's upcoming lunar sample-return missions.

Technical Support Specialist, SHIELD Illinois, Champaign, Illinois

Nov 2021 – June 2023

- Provided technical support at SHIELD Illinois, a nonprofit COVID-19 testing organization established by the University of Illinois System during the global pandemic to offer rapid, accurate, and affordable testing.
- Efficiently addressed and resolved urgent issues and feedback from patients, clients, and partners, managing support tickets and using Point-and-Click software for specimen tracking and client updates.
- Collaborated effectively with a diverse, multi-cultural team to gather and analyze feedback for service improvement, leading to the identification and implementation of significant updates to the knowledge-base, dedicating extra hours to enhance customer experience.

Teaching Assistant, Dept. of Aerospace Engineering UIUC, Champaign, Illinois

Aug 2022 – Dec 2022

- Served as a Graduate Teaching Assistant for the AE 402 – Orbital Mechanics course, playing a key role in facilitating student understanding and engagement with course material.
- Conducted weekly office hours, offering personalized assistance to students in comprehending lecture content, homework, and exam preparation, alongside the responsibility of grading various assignments to ensure timely and constructive feedback.
- Took on the responsibility of preparing and delivering comprehensive course material during lectures as required, demonstrating adaptability and a thorough grasp of course concepts.

Mechanical Design Intern, Skyroot Aerospace, Hyderabad, India

May 2021 – Aug 2021

- Designed, constructed, and tested a sophisticated ring-type gimbal mount for the Raman-I RCS engine used for attitude control of the Vikram-I rocket.
- Conducted comprehensive material analysis through Finite Element Analysis (FEA) to certify the gimbal's resilience under various structural and thermal loads, ensuring optimal performance and durability, and showcasing a keen understanding of structural and propulsion systems.
- Developed expertise in thrust vectoring systems, honing skills in computer-aided design (CAD) and FEA software, complemented by proficiency in technical report writing and delivering impactful presentations, enhancing project documentation and stakeholder communication.

Undergraduate Student Assistant, UIC, Chicago, Illinois

Sep 2018 – April 2019

- Gained valuable hands-on experience by working in the Machine Shop (subtractive manufacturing lab) and Makerspace (additive manufacturing lab).
- Acquired comprehensive expertise in shop and machine safety, adeptly utilizing computer-aided machining software, and operating a range of machinery including manual and CNC mills and routers, laser cutters, lathes, drill presses, belt sanders, and cutoff saws.
- Developed proficiency in the use of polymeric materials by mastering process-specific lab safety, computer-aided design for 3D printing, executing hands-on 3D printing projects, and applying intricate post-processing procedures.

PROJECTS

Graduate Research Assistant, NASA STTR Phase I, Champaign, Illinois

Aug 2022 – Aug 2023

- Led key efforts in a collaborative project with a multi-disciplinary team from NASA Jet Propulsion Laboratory, Ten One Aerospace, and UIUC on "[Assembly of Large Aperture Space Telescopes in Cislunar Space Using a Swarm of Autonomous Small Satellites](#)", as part of a NASA STTR project.
- Developed and implemented optimal guidance and control algorithms for satellite swarms, contributing to the successful simulations of servicing operations in cislunar and deep space.
- Responsible for comprehensive documentation and communication of project developments, including authoring formal reports for project deliverables and conducting bi-weekly technical presentations to update stakeholders on project progress.

Mechanical Design and Analysis Lead, UIC, Chicago, Illinois

Aug 2020 – May 2021

- Collaborated with senior design team members on the "[Picture and Video of Earth from the Edge of Space](#)" project, developing a craft capable of carrying a high-altitude balloon to the edge of space, equipped with onboard cameras to capture the entire journey from launch to landing.
- Assembled the craft by integrating multiple subsystems, including custom-made antennas, an electronics payload with video cameras, GPS, and an automatic landing system.

- Designed and tested a safe and reliable low-power release mechanism using a one-dimensional servo motor, designed to detach the payload from the balloon and enable its glide back to Earth for recovery.

Sub-Lead: Structures, AIAA UIC Chapter, Chicago, Illinois

Sep 2017 – Jan 2020

- Worked with the structures team to analyze the structural dynamics of rockets under diverse loads, leading efforts in fabricating and integrating key components such as nosecone, body, and motor.
- Achieved first place in Student Research and Development (SRAD) 30,000 ft and second place in Commercial-Off-The-Shelf categories at the 2018 Intercollegiate Rocket Engineering Competition, contributing significantly to a team competing in high-powered rocket contests nationwide.
- Contributed to continuous improvement in rocket design and performance, using simulations and physical testing to optimize stability, durability, and efficiency under challenging flight conditions.

AWARDS & HONORS

- **Associate Member, Sigma Xi, The Scientific Research Honor Society** *Elected Sep 2025*
- [John V. Breakwell Student Award](#), American Astronautical Society *Jan 2025*
- **Dean’s List, UIUC** *Aug 2022 – May 2023*
- **Honors “Cum Laude”, UIC** *May 2021*
- **Dean’s List, UIC** *Aug 2018 – May 2021*

SKILLS & RELEVANT COURSEWORK

- **Software:** MATLAB & Simulink, Python, SolidWorks, ANSYS, MS Office Suite, XFOIL, LaTeX.
- **Relevant Coursework:** Optimal Spacecraft Trajectories, Orbital Mechanics, Learn/Control Multi-Agent Systems, Spacecraft Attitude Control, Planetary Entry, Estimation of Dynamical System, Aerospace Systems Engineering, Optimum Control Systems, Systems Dynamics & Control, Numerical Methods.

LICENSES & CERTIFICATIONS

- **Private Pilot License, Federal Aviation Administration** *May 2023*
- **Graduate Specialization in Spaceflight Engineering, UIUC** *May 2023*
- **Advanced Parallel Computing, National Center for Supercomputing Applications** *Dec 2023*

PROFESSIONAL SERVICE

- **Peer Reviewer, Acta Astronautica** *Sep 2025 – Present*
- **Peer Reviewer, Journal of Guidance, Control, and Dynamics** *Nov 2025 – Present*
- **Peer Reviewer, The Journal of the Astronautical Sciences** *March 2026 – Present*