RUTHVIK BOMMENA

+1(312)909-6683 | bommena.ruthvik@gmail.com | LinkedIn | ORCiD | GitHub | Portfolio Website

EDUCATION

University of Illinois Urbana-Champaign (UIUC)
Ph.D. Aerospace Engineering — *Aug 2023 – Expected May 2027*
M.Sc. Aerospace Engineering — *Aug 2021 – May 2023*

University of Illinois Chicago (UIC) — *Aug 2017 – May 2021*
B.Sc. Mechanical Engineering

Institute of Aviation at Parkland College — *Aug 2022 – May 2023*
Private Pilot License

JOURNAL PUBLICATIONS

- **R. Bommena** and R. Woollands, "Line-of-Sight and Field-of-View Constrained Beacon Placement Optimization for Robust Relative Navigation," *Acta Astronautica,* 2026 [UNDER REVIEW].
- **R. Bommena**, H. Panag, and R. Woollands, "Optimal 6-DOF Control for Servicing and Assembly at Sun-Earth L2," *Journal of Guidance, Control, and Dynamics*, 2026. 10.2514/1.G009349
- 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
- **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
- **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
- 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

CONFERENCE PAPERS

- **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**, K. Nagpal, N. Mehr, and R. Woollands, "Optimal Multi-Agent Control and Planning Strategies for In-space Servicing and Assembly," *Joint Physics of Sensing/Astrodynamics Program Review – Air Force Office of Scientific Research*, 2024.
- **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 1*, 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

- **Recognition of Excellence Award,** *UIUC* *April 2026*
- **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**, *AIAA Journal of Guidance, Control, and Dynamics* *Nov 2025 – Present*
- **Peer Reviewer**, *The Journal of the Astronautical Sciences* *March 2026 – Present*
- **Peer Reviewer**, *Celestial Mechanics and Dynamical Astronomy* *April 2026 – Present*