Kruti Rajnikant Bhingradiya

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EDUCATION

PhD – Aerospace Engineering		
University of Maryland, College Park A. James Clark School of Engineering B.S. – Aerospace Engineering University of Maryland, College Park A. James Clark School of Engineering Honors in Aerospace Engineering GPA: 3.7/4 Minor – Robotics and Autonomous Systems Maryland Robotics Center		
	May 2024	
		May 2023
		AWARDS AND HONORS
	Aviation Week Network 20 Twenties	2024
UMD Department of Aerospace Engineering Chair's Award	2024	
UMD American Institute of Aeronautics and Astronautics Service Award	2024	
Adele's Circle of Women Scholarship	2024	
Pines Langford Scholarship	2024	
Nearspace Balloon Payload Program Director's Scholarship	2024	
UMD Department of Aerospace Engineering Chair's Award	2023	
AIAA Diversity Scholar	2023	
Hari Om Foundation Vikram Sarabhai Growing Scientist Award	2023	
Dean's List	2020-24	
AEROS Scholar	2022	
Maryland Robotics Center Pathways to Profession Scholar	2022	
Brooke Owens Fellowship, Finalist	2022	
UMD Sigma Gamma Tau Aerospace Engineering Honors Society	2021	
UMD Aerospace Engineering Honors Program	2021	

Technical and Research Experience

University of Maryland, College Park | Machine Learning for Dynamical Systems Lab

June 2024 – Present

May 2021 - May-2024

- Developing neural propagator models for orbital mechanics to improve computational efficiency while maintaining high fidelity in trajectory prediction.
- Exploring ways to create data-driven frameworks for multi-level trajectory propagation, including the integration of neural network models with traditional numerical solvers, bridging gaps between computational speed and physical accuracy.
- Creating neural network-based Lambert solvers capable of computing optimal transfer trajectories to improve computational speedups over traditional methods for interplanetary and rendezvous missions.

University of Maryland, College Park | Collective Dynamics and Controls Lab

Undergraduate Researcher

Graduate Research Assistant

- Designing, developing, and fabricating fish robots with a baseline model of a Joukowsky foil to model hydrodynamics stabilization.
- Implementing control laws based on visions and pressure sensing to sync the flapping of multi-agent robotic systems in water tunnels at high frequency flapping.
- Developed testbed for feedback control law experiments in high-speed water tunnels and wrote baseline software for data collection.

- Prototyped soft robotic actuators using multi material printing i.e., PolyJet Fusion, FDM and SLA to alternate for injection molding.
- Worked on and drove underwater ROV to assist graduate students obtain experimental data about transmission of • laser signal from ROV to quadcopter.

Quantum Space

Chief Engineer (Intern Project)

- *May 2023 Aug. 2023* • Led a team of interns for design and development of a 2U CubeSat and two 0.5U CubeSats to conduct MSI (Multi-Spectral Imaging) on a 3-axis stabilized platform and establish communications with the GS (Ground Station) to relay data in real time at vertical range of ~88 kft and slant range of 105kft in near space environment.
- Performed trade studies to identify frequencies for long range and short-range communications and bandpass filters • for MSI.
- Identified and documented Mission Success Criteria and hierarchical subsystems requirements for all individual • subsystems to comply with.
- Configured flight computer to integrate sensor stack and actuators within flight software and to enable duplex communication of telemetry data stream.
- Wrote python scripts to conduct on-board NDVI (Normalized Difference Vegetation Index) on the images captured • to be downlinked to GS.

NASA Jet Propulsion Laboratory | Extreme Environment Robotics Division

Robotics Engineering Intern, Visiting Researcher

- Developed steering system for robotic micro-swimmers for future missions for extraterrestrial ocean world exploration like Europa, Enceladus, Titan.
- Optimized actuators for the steering system of micro-swimmers by creating custom models of fluid dynamics.
- Prototyped actuators to observe the physical effects at micro scales and tested the actuators on custom testbed by • varying parameters.

UMD Nearspace Balloon Payload Program | Space Systems Laboratory

Payload and Operations Engineer

- Writing flight software and developing avionic stack for a tow body stabilization prototype for the Venusian balloon payload in collaboration with NASA JPL.
- Developing cutdown mechanism and implementing control algorithm for a payload to vent helium in-flight to achieve reduced ascent rate and float in stratosphere.
- Successfully achieved soft landing of payloads with significantly reduced descent rate after achieving neutral • buoyancy during first flight of the same payload.
- Developed payload to livestream video with high frequency RF communications for HD video downlink and • another payload to downlink images using SSTV protocol.
- Conducting pre-launch and launch operations including inflation measurements and tracking equipment set up to • launch on high altitude weather balloons and post launch tracking operations including flight trajectory prediction and telemetry.
- Designed and conducted workshops for Aerospace Engineering freshmen to develop high-altitude payloads.

Lawrence Livermore National Laboratory

Field Engineering Intern

- Launched weather balloons flights to float weather balloons in the upper stratosphere alongside NASA DCOTSS Earth Science Mission.
- Worked with atmospheric scientists to devise flight plans based on requirement of scientific objectives to plan trajectories of weather balloons without disturbing reserved aerospace in nearby regions and fly payloads for obtaining samples of beryllium atmosphere from upper stratosphere using high altitude weather balloons.

Advanced Fabrication Laboratory | Terrapin Works

Design Engineer, Lab Coordinator

- Designing and fabricating custom research support equipment for researchers using various industrial and scientific grade fabrication methods.
- Operating industrial and consumer grade additive manufacturing equipment including FFF, FDM, PolyJet Fusion, MJF, SLA and SLS 3D printers.

July 2022 – Aug. 2022

Dec. 2021 – Jan. 2022, May 2022 – June 2022



May 2021-Aug.2024

Jan. 2021 – Aug. 2024

• Instructor for operating power tools, Waterjet and CNC machines (Datron and EZ-Router) in a machine shop, PCB fabrication machines for custom electronics circuit designs.

TEACHING EXPERIENCE

Department of Aerospace Engineering University of Maryland, College Park	
Teaching Fellow – ENAE301 Dynamics of Aerospace Systems	Aug. 2023 – Present
• Supporting instructor by hosting office hours and review sessions in addition to grading an	d discussion session
<i>Teaching Fellow</i> – ENAE450 <i>Robotics Programming</i>	Jan. 2023 – May 2023
 Supported instructors by leading lab sessions for students to test and implement programs i framework. 	incorporating ROS
 Configured backend by setting up a bridge for Turtlebot3 running on ROS1 to comply with taught in class. 	n ROS2 implementation
• Designed a final challenge for students to test their learning experience.	
Teaching Fellow – ENAE283 Introduction to Aerospace Systems	Aug. 2022 – Dec. 2022
• Supported instructor with teaching class by hosting office hours, review sessions and discussion sessions.	
Mentoring underclassmen in introductory aerospace classes and hosting extra one-on-one s	sessions.
Academic Achievement Program University of Maryland, College Park	
Supplemental Instructor – CHEM135 General Chemistry for Engineers	Jan. 2021 – May 2021
• Devised curriculum suitable and supplementary to the course for minority engineering stud strengthen their foundational understanding of chemistry.	lents in order to
Instructor – MATH115 Precalculus	May 2021 – July 2021
• Full time instructor for 21 minority engineering students for them to get placed in MATH1- required course for engineers in first year.	45 Calculus I, the

SKILLS

- **<u>Programming & Frameworks</u>** C, C++, Python, MATLAB, ROS 1-2, CFS
- Modelling and Simulations Gazebo, Rviz, STK
- <u>Design</u> 3D Design Software (SolidWorks, Siemens-NX), PCB Design Software (KiCad, Eagle), Communication Design, System Design, 3D Slicing and Configuration, CAM Software (Fusion 360 and Machine specific)
- **Fabrication** Manual Machining, CNC, Consumer Grade 3D printers (FFF, FDM, SLA), Industrial Grade 3D printers (Powder Based Fusion, MultiJet Fusion, Powder Based Metal Printing, Fiber-reinforced FDM)
- <u>Non-technical</u> Leadership, Lab Management, Project Management, Event Planning, Systems Engineering

PUBLICATIONS

Journal Papers

 W. Yen , K. R. Bhingradiya, A. Regli, D. Paley; "Visual and Hydrodynamic Feedback Control of a Robotic Fish for Inline Swimming". IFAC-PapersOnLine, Volume 58, Issue 20, 2024, Pages 165-170, ISSN 2405-8963, (Paper)

Conference Papers

- 1. **K. R. Bhingradiya**; "Modelling, analysis and experimental evaluation of inline swimming with a soft robotic fish" AIAA Region 1 Conference. March 2024.(<u>Paper</u>)
- K. R. Bhingradiya, M. S. Calderon, R.W Fink, S.A. Sunilkumar, D. L. Akin, *et al.*; "Subsurface Ice and Terrain In-situ Surveyor (SITIS): A Large Scale Lunar Crater Prospector for Prolonged Exploration of Permanently Shadowed Regions of the Lunar South Pole," AIAA 2024-4818. *AIAA AVIATION FORUM AND ASCEND 2024*. July 2024.(Paper)

- E.W. Schaler, Z. Hao, A. Ansari, K.R. Bhingradiya, M.Reinders, M. Holst, H.J. Lee, M. Samnani, T. Schafer, J. Holland, B. Liang, J.Vizcarra, J.Israelevitz, S. Howell, E. Lesage; "Design and Development of SWIM Miniature, Untethered Underwater Robots for Exploring Ice-Ocean Interfaces". IEEE Aerospace Conference. March 2024.(Paper)
- J.J. Kuznetsov, A. Takeuchi, K.R. Bhingradiya, D. Grammer, M.S. Kalin, J.A.Bishop, M.L. Bowden; "Design, Optimization and Additive Manufacture of Generalized Helium Outflow Unit for Latex Balloons to Float". AIAA SciTech Forum. January 2024. (Paper)
- M. L. Bowden, K. R. Bhingradiya, D. Gribok, M. Griffin, M Kalin, J.J. Kuznetsov, M.Lebetkin, S. Maddren, S. Siddiqui, C. Storey; Lessons Learned For Tandem Launches. *Academic High Altitude Conference* 2022. (Paper)

LEADERSHIP AND OUTREACH

Women of Aeronautics and Astronautics(WoAA), Expansion Chair	2023 – Present
American Institute of Aeronautics and Astronautics (AIAA), Chair (UMD Branch)	2020 - 2024
UMD Balloon Payload Program, Student Government President	2022 - 2024
UMD Sigma Gamma Tau Aerospace Honors Society, Vice President	2022 - 2024
UMD Women in Aeronautics and Astronautics, Undergraduate Liaison	2020 - 2024
UMD Women in Engineering, Peer Mentor	2021 - 2024
UMD Clark School Ambassador	2021 - 2022

MEDIA

Aviation Week Network's 20 Twenties: <u>The 2024 20 Twenties</u>—Tomorrow's Aerospace Innovators | Aviation Week Network, Three UMD Students Named Among Aviation Week Network's Class of 2024 20 Twenties

Featured in department student story (UMD): <u>When the Road Gets Challenging, Keep Moving Forward | Department of Aerospace Engineering</u>

ACTIVE LICENSE

• ARRL Ham Radio License | Call sign KC2AAA o Class: Amateur Extra, General, Technician

Expires 2032