Ramchander Bhaskara

PhD Candidate · Aerospace Engineering

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Education

Texas A&M University — *College Station, TX*

PhD in Aerospace Engineering — *Jun 2021 - May 2025*

- Research: On-board sensing and navigation, embedded computing, computer vision.
- Advisor: Dr. Manoranjan Majji

Texas A&M University — *College Station, TX*

MS in Aerospace Engineering — *Aug 2019 - May 2021*

- Thesis: Hardware implementation of navigation filters for automation of dynamical systems
- Advisors: Drs. Manoranjan Majji & Robert Skelton

National Institute of Technology — *Trichy, India*

BTech in Instrumentation and Control Engineering — *Aug 2013 - Apr 2017*

- Thesis: Physics-based modeling of selective catalytic reduction system
- Advisor: Dr. Umapathy Mangalanathan

Professional Experience

Jun - Aug 2023	**Research Intern**, Robotics, NASA Jet Propulsion Lab Perception for sampling autonomy of Europa/Enceladus Lander. Empirically-valid sampling site rendering and multi-sensor modeling for passive and active machine vision [paper].
Jun - Aug 2022	**Student Researcher**, Robotics, NASA Jet Propulsion Lab IMU noise cancellation, Radar odometry for vehicle velocity state estimation.
2019 - 2024	**Graduate Research Assistant**, Land, Air, and Space Robotics Lab, Texas A&M University Research on computer vision, graphics, FPGA embedded solutions for sensing and navigation.
2017- 2019	**Intellectual Property Associate**, iRunway India Subject matter specialist for IP analysis on 5G infrastructure.

Publications

Published

Ramchander Bhaskara, Manoranjan Majji, and Felipe Guzman. Quantized State Estimation for Linear Dynamical Systems. Sensors 2024. [Paper]

Ramchander Bhaskara, G Georgakis, J Nash, J Bowkett, M Cameron, A Ansar, P backes, and M Majji. 2024. Icy Moon Surface Simulation and Stereo Depth Estimation for Sampling Autonomy. IEEE Aerospace Conference. [Paper] [Software]

Ramchander Bhaskara, Roshan T Eapen, Davis Adams, Caleb Peck, and Manoranjan Majji. 2025. Development and Validation of Velocimeter Lidar Simulator. Accepted to AIAA SciTech. [Poster]

Ramchander Bhaskara, Roshan T Eapen, and Manoranjan Majji. 2023. Differentiable Rendering for Pose Estimation in Proximity Operations. (**Finalist, graduate student papers**) AIAA Scitech Forum. [Paper]

Ramchander Bhaskara, Kookjin Sung, and Manoranjan Majji. 2022. An FPGA framework for Interferometric Vision-Based Navigation (iVisNav). 41^{st} Digital Avionics and Systems Conference. (**Best student research paper**). [Paper]

Ramchander Bhaskara, and Manoranjan Majji. 2022. FPGA Hardware Acceleration for Feature-Based Relative Navigation Applications. 2022 AAS/AIAA Astrodynamics Specialist Conference. [Paper]

Andrew Verras, Roshan T Eapen, Andrew Simon, Manoranjan Majji, **Ramchander Bhaskara**, Carolina I Restrepo, and Ronney Lovelace. 2021. Vision and Inertial Sensor Fusion for Terrain Relative Navigation. AIAA 2021 Scitech Forum. [Paper]

Kookjin Sung, **Ramchander Bhaskara**, and Manoranjan Majji. 2020. Interferometric Vision-Based Navigation Sensor for Autonomous Proximity Operation. 39^{th} Digital Avionics and Systems Conference. [Paper]

In Review

Ramchander Bhaskara, Roshan T Eapen, and Manoranjan Majji. On applications of high-fidelity visual data synthesis in space mission designs. Journal of Advances in Space Research.

In Prep

Ramchander Bhaskara, Manoranjan Majji, and Felipe Guzman. All Digital Phase Detection for the Optomechanical Accelerometer Sensor.

Ramchander Bhaskara, and Manoranjan Majji. Estimation of Linear System States from Quantized Inputs and Measurements.

Awards, Fellowships, Grants & Committees

2024	**AIAA**, Guidance, Navigation, and Control Graduate Award
2024	**Member of AIAA technical committee**, Sensor Systems and Information Fusion
2023	**Finalist, GNC Conference Graduate student papers**, SciTech Forum 2023
2021-24	**Graduate Excellence Fellowship**, Dept. of Aerospace Engineering, Texas A&M University
2022	**2nd place, Best student research papers**, Digital Avionics Systems Conference (DASC)
2022	**ASIE Scholarship**, American Society of Indian Engineers and Architects, Houston
2021	**NASA TechLeap Prize**, Control systems lead for autonomous sub-orbital plume tracking experiment, NASA Flight Opportunities Program

Talks

Ramchander Rao Bhaskara. 2023. Scratching the Surface of Europa and Enceladus. Jet Propulsion Laboratory, Caltech.

Ramchander Rao Bhaskara. 2023. Study of Topology of Icy Moons. Jet Propulsion Laboratory, Caltech.

Ramchander Rao Bhaskara, Roshan T Eapen, Andrew Verras and Manoranjan Majji. 2021. Texas A&M ScORE: Space Object Rendering Engine. Lunar Surface Innovation Consortium, Applied Physics Laboratory, John Hopkins University.

Teaching

2024	**AERO 423:Orbital Mechanics**, Teaching Assistant [Course work]	*Spring & Fall*
2023	**Digital Signal Processing**, Seminar talk	*Fall*

Select Projects

Vision-based gimbal control for object tracking

Prof. Daniel Selva, TAMU

- Prototype: Kernelized Correlation Filters (KCF) and PID control for pan-tilt object tracking.
- NASA flight experiment: Implemented 3U gimbal payload for tracking plumes from 100,000 ft.

Spacecraft pose estimation aided by neural networks

Prof. Tie Liu, TAMU

- Dataset: Automated generation of custom synthetic images with space station, using the Mitsuba ray-tracing engine.
- Pipelined pose estimation in three stages: object localization (YOLOv3), keypoint detection (ResNet50), and perspective projection (PnP).

Fast Fourier Transform on FPGA

Profs. Manoranjan Majji and Paul Gratz

- Implemented digital IIR filters for signal processing, HDMI display controller for video output, pipelined architecture for real-time implementation of the Fast Fourier Transform (FFT) algorithm on Digilent Zybo Z7020 FPGA.

Service

2023-24 **Aerospace Engineering Graduate Student Association**, Professional Development Chair

2020-23 **Texas A&M University Science Festival**, Volunteer

2017 - 2019 **Bhumi (NGO)**, Volunteer Teacher of Physics *Bangalore*

REVIEWED: Transactions on Computers, IEEE Control Systems Letters, American Control Conference, AIAA SciTech Forum, IEEE Aerospace Conference.

References

Prof. Manoranjan Majji Texas A&M University
Associate Professor, Dept. of Aerospace Engineering

Prof. Roshan Eapen Penn State University
Assistant Professor, Dept. of Aerospace Engineering

Dr. Georgios Georgakis Jet Propulsion Laboratory
Robotics Technologist

Prof. Felipe Guzman University of Arizona
Professor of Optical Sciences