Ramchander Bhaskara

PhD Student · Aerospace Engineering

Texas A&M University, College Station, TX 77843

bhaskara@tamu.edu | ram-bhaskara.github.io | ram-chander

Education

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

PhD in Aerospace Engineering — *Jun 2021 - present*

- Focus: Navigation filters, hardware/software codesign, computer vision & graphics
- 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

Jul 2022 - present	**Visiting Student Research Intern**, Robotic Systems, Jet Propulsion Lab, Caltech Developing RADAR inertial odometry for ground vehicle autonomy.
Sept 2019 - present	**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.
Jun 2017- Jun 2019	**Associate of Intellectual Property**, iRunway India Pvt Ltd Patent analyst as a subject matter specialist on computer architecture and 5G infrastructure.
May 2016 - Jul 2016	**Intern**, Reliance Industries Development and testing of relays for motor control circuits.

Publications

Published

Ramchander Rao, Bhaskara, Kookjin Sung, and Manoranjan Majji. 2022. An FPGA framework for Interferometric Vision-Based Navigation (iVisNav). 41^{st} Digital Avionics and Systems Conference.

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

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

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

In Review

Roshan T Eapen*, **Ramchander Rao Bhaskara***, and Manoranjan Majji. 2022. NaRPA: Navigation and Rendering Pipeline for Astronautics. of Guidance, Control, and Dynamics.

Ramchander Rao Bhaskara, Roshan T Eapen, and Manoranjan Majji. 2022. Differentiable Rendering for Pose Estimation in Non-cooperative Proximity Operations. AIAA Scitech 2023 Forum.

In Prep

Ramchander Rao Bhaskara, Patrick Kelly, and Manoranjan Majji. 2022. FPGA architecture for high-speed estimation from inertial sensors. IEEE Sensors Journal.

Awards, Fellowships, & Grants

2021 **NASA TechLeap Prize**, NASA Flight Opportunities Program
2021 **Graduate Excellence Fellowship**, Dept. of Aerospace Engineering, Texas A&M University
2018 **IIT Madras Summer Research Fellowship**, Dept. of Aerospace Engineering, Indian Institute of Technology, Madras

2015 - 17 **RECT Silver 72 Scholarship**, National Institute of Technology, Trichy
2011 **State rank 9**, Board of Secondary Education, Andhra Pradesh, India
2010 **Silver medal**, National Level Science Talent Search Examination (NSTSE), India

Presentations

Ramchander Rao Bhaskara, Roshan T Eapen, and Manoranjan Majji. 2022. Texas A&M ScORE: Space Object Rendering Engine. Pathways Research Symposium, Texas A&M University.

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.

Fall 2021. *Embedded System Design with FPGAs*. Seminar, Land, Air, and Space Robotics Lab, Texas A&M University.

Projects

Vision-based gimbal control for object tracking *Jan 2022 - Jun 2022*

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

Spacecraft pose estimation aided by neural networks *Dec 2021*

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

Hardware design *Dec 2019 - present*

- 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.

Others

- Optimal control: iLQR based tensegrity structure control using MuJoCo physics simulator, spacecraft vertical landing problem.
- Terrain relative navigation: Synthetic velocimetry using ray-tracing based Lidar, camera simulation., point-cloud registration, and pose estimation.

Outreach & Professional Development

2020 **Texas A&M University Science Festival**, Volunteer
2017 - 2019 **Bhumi (NGO)**, Volunteer Teacher of Physics *Bangalore*