

# Ramchander Bhaskara

PHD STUDENT · AEROSPACE ENGINEERING

Texas A&M University, College Station, TX 77843

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## Education

### Texas A&M University

#### PHD IN AEROSPACE ENGINEERING

- Dissertation: On-board sensor data processing and state estimation using FPGA embedded systems
- Advisor: Dr. Manoranjan Majji

College Station, TX

Jun 2021 - Dec 2024

### Texas A&M University

#### MS IN AEROSPACE ENGINEERING

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

College Station, TX

Aug 2019 - May 2021

### National Institute of Technology

#### BTECH IN INSTRUMENTATION AND CONTROL ENGINEERING

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

Trichy, India

Aug 2013 - Apr 2017

## Professional Experience

- Jun 2023 - Aug 2023 **Visiting Student Research Intern (JVS RP)**, Robotics, Jet Propulsion Lab, Caltech  
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 2022 - Aug 2022 **Student Researcher**, Robotics, Jet Propulsion Lab, Caltech  
Velocity benchmarking, IMU noise cancellation, RADAR odometry for vehicle velocity state estimation.
- Sept 2019 - Dec 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.
- Jun 2017- Jun 2019 **Associate of Intellectual Property**, iRunway India  
Patent analyst as a subject matter specialist on computer architecture and 5G infrastructure.

## Publications

### PUBLISHED

- Ramchander Bhaskara**, G Georgakis, J Nash, J Bowkett, M Cameron, A Ansar, P backs, and M Majji. 2024. Icy Moon Surface Simulation and Stereo Depth Estimation for Sampling Autonomy. IEEE Aerospace Conference.
- Ramchander Bhaskara**, David van Wijk, Roshan T Eapen, Davis Adams, Caleb Peck, and Manoranjan Majji. 2024. Development and Validation of Velocimeter Lidar Simulator. AAS GNC Conference. [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.
- Ramchander Bhaskara**, Kookjin Sung, and Manoranjan Majji. 2022. An FPGA framework for Interferometric Vision-Based Navigation (iVisNav). 41<sup>st</sup> Digital Avionics and Systems Conference. **(Best student research paper)**.
- Ramchander 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 Bhaskara**, Carolina I Restrepo, and Ronney Lovelace. 2021. Vision and Inertial Sensor Fusion for Terrain Relative Navigation. AIAA 2021 Scitech Forum.
- Kookjin Sung, **Ramchander Bhaskara**, and Manoranjan Majji. 2020. Interferometric Vision-Based Navigation Sensor for Autonomous Proximity Operation. 39<sup>th</sup> Digital Avionics and Systems Conference.

## IN REVIEW

**Ramchander Bhaskara**, Manoranjan Majji, and Felipe Guzman. Quantized State Estimation for Linear Dynamical Systems. Sensors Journal.

**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.

## Awards, Fellowships, Grants & Committees

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- 2024 **AIAA**, Guidance, Navigation, and Control Graduate Award
- 2024 **Member of AIAA technical committee**, Sensor Systems and Information Fusion
- 2023 **Graduate Mentoring Academy Fellow**, Texas A&M University
- 2023 **Finalist, GNC Conference Graduate student papers**, SciTech Forum 2023
- 2021-24 **Graduate Excellence Fellowship**, Dept. of Aerospace Engineering, Texas A&M University
- 2024, 23 **Travel Award**, 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
- 2022 **Travel Award**, Office of Graduate and Professional Studies, Texas A&M University
- 2021 **NASA TechLeap Prize Winners**, Control systems lead for autonomous sub-orbital plume tracking experiment, NASA Flight Opportunities Program
- 2016 **IIT Madras Summer Research Fellowship**, Dept. of Aerospace Engineering, IIT Madras
- 2015 - 17 **RECT Silver 72 Scholarship**, National Institute of Technology, Trichy

## Presentations

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**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**. 2022. FPGA hardware acceleration for interferometric-vision based navigation. Poster at DASC Conference, Virginia.

**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.

## Teaching Experience

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- Spring, **AERO 423: Orbital Mechanics**, Teaching Assistant
- Fall'24
- Fall'23 **Digital Signal Processing**, Seminar lecture

## Mentoring

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- 2023-2024 **Nathan Long**, PhD student, Texas A&M University
- 2024 **Kaitlyn Moore**, undergraduate student, Texas A&M University
- 2024 **Omar Mohmand**, undergraduate student, Texas A&M University
- 2024 **Marco Peredo**, undergraduate student, Texas A&M University

## Projects

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### VISION-BASED GIMBAL CONTROL FOR OBJECT TRACKING

*Jan 2022 - Jun 2022*

- 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

*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.

## Service

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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*