Rahi Shah

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Summary

Aerospace engineer and researcher with experience in dynamics modeling, control design, and trajectory optimization. Skilled in Hamilton-Jacobi reachability, Physics-Informed Neural Networks (PINNs), and astrodynamics simulations. Experience in safe autonomous system design, guidance, navigation, and control strategies for space and robotic systems.

Education

2026 M.S. Aerospace Engineering, **Embry-Riddle Aeronautical University**, GPA: 4.0/4.0

2024 B.Tech Computer Science
Minor: Mechanical Engineering, **Ahmedabad University**, GPA: 3.24/4.0

Research and Academic Positions

Student Assistant, Explainable Intelligence for Space(XD) Lab, Embry-Riddle Jan 2025 – Present

- Working under **Dr. Di Wu** on quantum communication and orbital dynamics for cislunar missions.
- Modeling, simulating, and analyzing Quantum Key Distribution (QKD) performance under CR3BP-based orbital environments.
- Assisting with data collection, numerical simulations, and manuscript preparation for publications.

Grader, Embry-Riddle Aeronautical University Aug 2025 – Present

- Courses: ES 204 (Dynamics), MA 441 (Mathematical Methods for Engineering and Physics I), AE 313 (Space Mechanics).
- Responsibilities include grading assignments, assisting students during office hours, and providing feedback for improvement.

Publications

- **G. Halder**, R. Majumder*, R. M.R., **Rahi Shah**, S. Sundaram, "NeuroHJR: Hamilton-Jacobi Reachability-based Obstacle Avoidance in Complex Environments with Physics-Informed Neural Networks," *Indian Control Conference (ICC 2025).* **Accepted.**
- **Di Wu**, **Rahi Shah**, VictorRodriguez-Fernandez, "Guiding Generative AI solution for Fundamental Astrodynamics Problems," *AIAA Conference*, Orlando, Florida, Jan. 2026.

Research and Work Experience

Research Intern, Indian Institute of Science (IISc) Jan 2024 – Jul 2024

- Developed control frameworks integrating Hamilton-Jacobi reachability analysis with PINNs for obstacle avoidance in autonomous systems.
- Modeled nonlinear dynamics for robotic systems with formal safety guarantees.
- Validated scalable learning-based reachability methods in high-dimensional control environments.

Astrodynamics Engineer Intern, Digantara May 2024 – Sep 2024

- Characterized satellite dynamics and developed a swath modeling tool for payload, orbit, and operational analysis.
- Automated satellite database creation using data scraping and analysis of satellite attributes.
- Conducted trajectory and coverage estimation for constellation planning.

Flight Dynamics and Control Engineer Intern, Agnikul Cosmos Jun 2023 – Aug 2023

- Simulated 3DOF single-stage launch vehicle trajectories using RK2/3, RK4/5, and Dormand–Prince integration schemes.
- Implemented and optimized flat-Earth guidance laws to achieve desired altitude and velocity profiles.
- Conducted sensitivity analysis on guidance parameters and initial conditions.

Projects

Long Range Voice Controller Robotic Arm Remote-controlled robotic arm via cellular network using touch-tone dialing. [Demo]

Wine Quality Detection Machine learning solution for predicting red (1600) and white (4900) wine quality using Decision Trees, Logistic Regression, Bayes, and KNN. Conducted preprocessing and exploratory data analysis. [Demo]

CubeSat Environment Monitoring Real-time environmental monitoring using CubeSat sensors (BMP180, GY521, HC-SR04) with Arduino and Raspberry Pi. Secure data transmission and web-based visualization implemented. [Demo]

Audio Augmented Glasses Smart glasses for visually impaired to detect objects and provide audio feedback using Raspberry Pi and camera. [Demo]

Depression Monitoring System Bayesian network and probabilistic models to estimate depression and anxiety likelihood; integrated Variable Elimination for advanced queries. Used by psychologists for patient analysis.

Certificates

ROS2 Udemy Course (2024), Simulink Onramp (2023), Control Design Onramp (2023), MATLAB Fundamentals (2023)

Technical Skills

Programming:	Python, C++, MATLAB, ROS2, MySQL, SciLab
Modeling & Tools:	Simulink, AutoCAD, Arduino, Git, Raspbian, Logisim, Verilog
Research Focus:	Control Design, Trajectory Optimization, Reachability Analysis, Machine Learning, Astrodynamics
Interpersonal:	Collaboration, Problem Solving, Analytical Reasoning, Adaptability, Communication