

Antar Mazumder

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Education

Colorado School of Mines

PhD in Robotics

- Doctoral research focused on space and field robotics.
- Program start date: August 15, 2025.

Golden, Colorado, USA

August 2025 – Present

Rajshahi University of Engineering and Technology (RUET)

BSc in Mechatronics Engineering (MTE)

- Graduated with a CGPA of 3.53 out of 4.00 and three (3) technical scholarships.
- **Courses:** Control Systems, Robotics, Human-Robot Interaction, Machine Learning Algorithms, Machine Dynamics and Vibrations, etc.

Rajshahi, Bangladesh

January 2018 – October 2023

Research Interests

Robot Perception, Navigation, Planetary Explorers, Digital Twin, SLAM, Swarm as Secondary Explorers (SaSE), Robotic Prostheses, Deep Learning

Skills

Programming Languages	Python, Solidity, C/C++.
Libraries & Tools	Pandas, PyTorch, TensorFlow, NumPy, Scikit-learn, ONNX, OpenCV, Open3D, PyTorch3D.
Mechanical Design & Simulation	Fusion 360, SolidWorks, Gazebo.
Frameworks & Platforms	Robot Operating System (ROS) 1 & 2, MATLAB, Edge Impulse, KiCad, Arduino, ESP32, Raspberry Pi, Linux.
Soft Skills	Public Speaking, Teamwork, Problem-solving, Documentation, Engaging Presentations.

Research and Work Experience

Robotic Space Exploration (RoSE) Lab, Colorado School of Mines

Graduate Research Assistant & Digital Twin Sub-team Lead

- Researching high RTF simulation backend for digital twin reconstruction.
- Engineering multi-modal robot perception for robotic space exploration.
- Reconstructing the digital twin of Mines Lunar Surface Simulation (MLSS) testbed
- Contributing to mission-driven space robotics research under the guidance of Dr. Frankie Zhu (PI), with emphasis on planetary exploration and autonomous robotic operations.

On-site, Golden, Colorado, USA

August 2025 – Present

Robotic Space Exploration (RoSE) Lab, Colorado School of Mines

Remote Research Assistant

- Engineered a near real-time simultaneously segmented dense mapping pipeline for terrain classification.
- Developed a GPU-less fast terrain deformation model based on contact surface model and voxelization.
- Engineered RTG, a rapid terrain generator from a single input image for Isaac Sim and Gazebo.

Remote

February 2025 – August 2025

FringeCore_

Software Engineer – Machine Learning Applications

- Engineered vision-based product management and survey automation systems, streamlining data acquisition pipelines.
- Spearheaded an EdgeAI-powered vision-based inventory counting system deployed at City Group, enhancing operational accuracy and scalability.
- Developed multi-modal vision-language intelligence tools for business analytics, improving decision-making capabilities across enterprise platforms.

On-site, Dhaka, Bangladesh

February 2025 – July 2025

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Machine Learning Engineer

- Engineered a deep learning-based deblurring algorithm for the nation's first and only muzzle-based livestock recognition system, enhancing insurance verification processes.
- Co-Principal Investigator (Co-PI) for developing research proposals targeting national and international grant funding.
- Designed and implemented the country's first AIoT-driven multi-modal cow ovulation-period monitoring system, boosting agricultural efficiency.

On-site, Dhaka, Bangladesh

July 2024 – Present

Publications and Research Articles

1. Mazumder, A., and Madhiha, Z. A., 2024. *L-VITeX: Light-weight Visual Intuition for Terrain Exploration*. arXiv [Online]. Available: <https://arxiv.org/abs/2410.07872>
2. Mazumder, A., Sahed, M.F., Tasneem, Z., Das, P., Badal, F.R., Ali, M.F., Ahamed, M.H., Abhi, S.H., Sarker, S.K., Das, S.K. and Hasan, M.M., 2023. *Towards next generation digital twin in robotics: Trends, scopes, challenges, and future*. Heliyon, 9(2). [**Current Citation: 114+**]
3. Mazumder, A., Niloy, M.A., Sahed, M.F., Madhiha, Z.A., Badal, F.R., Uddin, J. and Hossain, M.Z., 2022, July. *Performance Evaluation of Navigation Schemes for Autonomous Exploration of a Secondary Explorer Rover in a Martian Lava Cave*. In 2022 IEEE Region 10 Symposium (TENSYP) (pp. 1-6). IEEE.
4. Dewan, T., Sarker, Y., Mazumder, A., 2025. *A Transformer-In-Transformer Network-Based Knowledge Distillation Framework For Image Recognition*. Submitted to IEEE Access.

5. *Madhiha, Z. A., Mazumder, A., and Hiam, S. M., 2024. A Cost-effective, Stand-alone, and Real-time TinyML-Based Gait Diagnosis Unit Aimed at Lower-limb Robotic Prostheses and Exoskeletons. arXiv [Online]. Available: <https://arxiv.org/abs/2411.08474>*

Selected Projects

RoSE Terrain Generator (RTG)

February 2025

[Code Repository](#) | [Video](#)

- Developed a zero-shot terrain generator that converts a single monocular aerial image into a 3D terrain mesh, ready for use in robotic simulators like Isaac Sim and Gazebo.
- Integrated multimodal sensing data to enhance terrain fidelity for space robotics and autonomous rover simulations.
- Enabled rapid generation of virtual testbeds for planetary and extreme environment exploration, reducing dependence on satellite or multi-angle drone data.
- Featured in *ROS News for the Week*, February 24th, 2025, and presented as an invited talk at the Gazebo Community Meeting, April 30th, 2025.
- Technical Skills:** Python, C++, ROS, 3D Reconstruction, Gaussian Splatting, Virtual Testbed Creation.

L-VITeX: Light-Weight Visual Intuition for Terrain Exploration

August 2024 - September 2024

[Paper](#) | [Video \(3D Reconstruction\)](#)

- Engineered a TinyML-based computationally efficient approach for terrain exploration and visual guidance aimed at resource-constrained explorers and small robot swarms.
- Attained up to 99% Region of Interest detection accuracy at less than 200 KB peak RAM occupation.
- Executed 3D reconstruction of terrain environments using monocular camera-based Gaussian Splats as a proof of concept.
- Technical Skills:** Edge Impulse, Python, C++.

A Digital Twin-Assisted Hybrid Approach to Optimal Trajectory Planning for Serial Manipulators under Temporal Feedback Decay

January 2023 - October 2023

[Undergrad Thesis](#) | [Video](#)

- Developed a ROS-based XGBoost(AI)-assisted twin-sync mechanism to address the temporal decay of actuator feedback for optimal fidelity between the digital twin and physical robo.
- Technical Skills:** Robot Operating System (ROS), MoveIt, Python, C++, PyTorch, AutoML, Linux tools.

3D Mapping of a Martian Lava Cave Simulation & Obstacle Cluster Segmentation based on RANSAC and DBSCAN

January 2022 - August 2022

[Code & Video \(3D Mapping\)](#) | [Code \(Segmentation Wrapper\)](#)

- Integrated Octomap to reconstruct a simulated Martian lava cave in 3D using a simulated six-wheeled UGV.
- Extended by RANSAC & DBSCAN-based obstacle cluster segmentation in ROS-Gazebo.
- Featured in *ROS News for the Week* (as of 23 January 2022), available at- [ROS Discourse Hyperlink](#).
- Technical Skills:** Robot Operating System (ROS), Python, C++, Linux tools.

Planetary explorers and other projects available at- <https://sites.google.com/view/antarbio/my-projects> **[Personal Site]**

Awards, Features, and Certifications

2025	Invited Talk at Gazebo Community Meeting, Presented RoSE Terrain Generator, April 30th, 2025
2025	ROS News for the Week, Featured RoSE Terrain Generator, February 24th, 2025
2023	11th Global Position in the International Rover Design Challenge 2023, Team Achievement as Team Lead, Granted by Space Robotics Society (SPROS)
2023	Technical Scholarship -4 th Academic Year, Granted by Rajshahi University of Engineering & Tech. (RUET)
2023	Technical Scholarship -3 rd Academic Year, Granted by Rajshahi University of Engineering & Tech. (RUET)
2022	ROS News for the Week, January 23 rd , Featured by ROS Discourse
2021	AI-102: Microsoft Azure AI & AZ-104: Microsoft Azure Administrator, Certificates issued by Microsoft
2019	Technical Scholarship -1 st Academic Year, Granted by Rajshahi University of Engineering & Tech. (RUET)
2019	27th Global Position in European Rover Challenge (ERC), 2019, Team Achievement as Control Team Member, Granted by European Space Foundation (ESF)
2019	Champion, GPH Ispat Esho Robot Banai, RUET Hackathon Round, Granted by Esho Robot Banai

References

Dr. Frances Zhu	PhD Thesis Supervisor, Assistant Professor, Department of Mechanical Engineering Affiliated Faculty, Robotics and Space Resources Programs Colorado School of Mines, Golden, CO, USA Email: frankie.zhu@mines.edu
Mrs. Zinat Tasneem	Undergraduate Thesis Supervisor, Assistant Professor, Dept. of Mechatronics Engineering, Rajshahi University of Engineering and Technology (RUET), Rajshahi, Bangladesh. Email: zinattasneem@mte.ruet.ac.bd