Marzanul Momenine

Student— AI/ML — Robotics — Underwater Robotics— CAD

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Summary

Engineer and researcher specializing in robotics, autonomous systems, and applied AI, with experience bridging advanced research and real-world engineering implementation. Skilled in designing full-stack robotic architectures integrating perception, control, and communication layers using ROS/ROS2, C++, and Python. Developed and deployed intelligent systems across Mars rover and underwater AUV platforms featuring DVL, INS, and RTK-GPS–based navigation, edge AI processing on Jetson hardware, and modular embedded control using STM32 and Teensy microcontrollers. Published in IEEE and leading research on multimodal glacier segmentation using hybrid Mamba–Transformer–CNN models. Passionate about creating resilient, data-driven robotic systems that combine machine learning, control theory, and system engineering for reliable autonomous operation in challenging environments.

Education

BRAC University *May 2022 – Jan 2026*

BS in Computer Science, Dhaka, Bangladesh

- CGPA: 3.67/4.0 (Expected)
- Research Focus:Advanced Electronics, Underwater and Aerial Vehicle Navigation, Robotics, Control Systems, Computer Vision, Satellite and Remote Sensing Imagery, Sensor Fusion, Edge AI Devices, Computer Networking, and Large Language Models (LLMs) and System Automation.

Notre Dame College *2019 – 2021*

High School Diploma, Science, Dhaka, Bangladesh

Publications & Research Projects

- **Evaluating Online Sexism Detection: A Comparative Study of Machine Learning Models using the EDOS Dataset**, *2024 IEEE 9th International Conference for Convergence in Technology (I2CT).*
  DOI: 10.1109/I2CT61223.2024.10543680
- **Glacier-Seg: A Lightweight Hybrid Mamba–Transformer–CNN Model for Multimodal Glacier Segmentation** (in preparation).
  GitHub: github.com/meherubahasin/Glacier-Seg
  Developing and evaluating multimodal segmentation models (U-Net, SegFormer, Mamba) on SAR, DEM, and optical datasets to quantify glacier retreat and morphological change.

Research Experience

Co-Team Lead, *BRACU Mongol Tori (University Rover Team)* *Sept 2022 – Present*

- Led a ∼40-member interdisciplinary team through the full lifecycle of designing, building, and competing internationally with a Mars rover prototype.
- Designed and implemented the rover's core software architecture (ROS, C++, Python), including autonomous navigation, control, and telemetry systems.
- Developed control algorithms, inverse kinematics, and electronics integration for the robotic arm and drive subsystems.
- Built the human–rover interface (HRI) and onboard networking system with secure telemetry and real-time mission data streaming.
- Integrated RTK-GPS mapping, an SBG Systems Ellipse D INS, and SATELLINE-EASy telemetry for precise localization and long-range communication.
- Contributed to modular mechanical subsystem design, ensuring rapid component replacement and reliable field maintenance.

Control Systems & Electronics Sub-Team Lead, *BRACU Duburi (Underwater AUV Team)* *Nov 2023 – Present*

- Designed and implemented the complete control, electronics, and navigation systems for an autonomous underwater vehicle (AUV).

- Developed embedded firmware for motor control, sensor fusion, and data communication, integrated with a ROS-based control framework.
- Implemented navigation using Nortek DVL 1000 and Witmotion INS, with onboard computation via NVIDIA Jetson Nano/Orin.
- Built a multi-camera computer vision and acoustic localization pipeline for real-time perception and mapping in turbid environments.
- Designed modular power management and isolation systems optimized for submerged, high-pressure operation.

Skills

Programming Languages: Python, C/C++, Bash, PowerShell, SQL
AI / Data Science: TensorFlow, PyTorch, Scikit-learn, Keras, LangChain, Pandas, NumPy, NLP, Computer Vision, Deep Learning, Reinforcement Learning, Vector Databases (FAISS), Bioinformatics Pipelines, Model Optimization (LoRA, QLoRA)
Embedded Systems & Robotics: ROS/ROS2, Arduino, Raspberry Pi, ESP32, **Teensy**, **STM32**, **ATmega**, **RP2040**, FreeRTOS, Embedded C/C++, Control Systems, Inverse Kinematics, Path Planning (CBS, Nav2), Sensor Fusion, RTK-GPS, DVL Integration, IMU/INS Calibration, Edge AI (Jetson Nano, Orin), PCB Design (Eagle, Proteus), Circuit Design & Debugging, Power Electronics, LTSpice
Web & Interface Development: Flask, REST APIs, HTML5, CSS, JavaScript, PHP, WebUI Integration, MySQL, NoSQL
Networking & Systems: Linux, Docker, Git, CI/CD, Windows Automation, Reverse Engineering, Secure Communication, Networking, AWS, Agile Methodologies
Professional: Team Leadership, System Design Review, Project Management, Technical Documentation, Cross-disciplinary Collaboration, Critical Thinking, Communication

Honors & Awards

- **16th Place**, University Rover Challenge, The Mars Society, Utah, USA (Jun 2023)
- **8th Place**, University Rover Challenge, The Mars Society, Utah, USA (Jun 2025)
- **8th Place**, Robosub 2025, Robonation, Arlington, USA (Jul 2025)
- **Champion**, Mindsparks 2023 Project Showcasing – BRACU Ognibir (Firefighting Robot), AUST Innovation & Design Club, Dhaka, Bangladesh (Jul 2023)

Certificates & Training

- **Deep Learning Specialization**, Coursera (2025)
- **Amateur Radio Operator License**, Bangladesh Telecommunication Regulatory Commission (BTRC)

References

Dr. Amitabha Chakrabarty, PhD
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