Nainaiu Rakhaine

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Academic Summary

Embedded systems researcher with practical expertise in IoT, TinyML, and low-power hardware design. Currently working as a Electronic Content Engineer at JLCPCB, creating content on embedded systems and PCB design. Published in a Q2 journal and multiple IEEE conferences; contributed to Bangladesh's first Level 2 autonomous vehicle and developed hardware now used in academic labs.
Research interests include: Wearable device, low-power IoT devices, and TinyML-powered embedded intelligence for health, environment, and mobility applications.

Education

Shahjalal University of Science and Technology (SUST), February 2020 – July 2025
BS in Electrical and Electronic Engineering

s **CGPA:** 3.17/4.00
Thesis: Developed and deployed a novel TinyML framework with IoT integration for the successful detection and prediction of faults in induction motors with remote monitoring. Achieved 93% accuracy.

Research Experience

Research Assistant, *Prof. Dr. Mohammad Shahidur Rahman* July 2024 – 2025

- Contributed to the development of Bangladesh's first Level 2 autonomous vehicle (AutoMAMA), delivering key modules for sensor integration, control systems, and embedded systems programming for carrying primarily 2 people.

Research Assistant, *Assoc. Prof. Dr. Md Rasedujjaman* July 2023 – Present

- Developed custom ESP32-S3 data logger board for University Embedded Systems Lab, now actively used in research projects and student training
- Investigated state-of-the-art low-power communication protocols and integrated designs into IoT-enabled P10 display Notice board using MQTT.

Research Assistant, *Asst. Prof. Arif Ahammad* June 2022 – Present

- Built a multi-modal attendance system (face recognition, fingerprint) deployed at university events for reliable access tracking.
- Developed a hybrid solar–wind-powered IoT system for sustainable, off-grid environmental monitoring with real-time data transmission and energy-efficient operation.

Peer-Reviewed Publications(Journal + Conferences)

- **MLPNN and Ensemble Learning Algorithm for Transmission Line Fault Classification**. *International Transactions on Electrical Energy Systems (Q2 Journal, Wiley)*.
- **A Comprehensive Android App-Based Solution for Automated Attendance and Management in Institutions Using IoT and TinyML.**. *(ICICT4SD 2023 – Intl. Conference on ICT for Sustainable Development.)*.
- **A Comparative Analysis of Power Consumption and Security Features in LoRa and LoRaWAN Messaging Devices**. *(ICAEEE 2024 - Intl. Conference on Advances in Electrical & Electronic Engineering)*.
- **IoT-Driven Smart Workplace Ecosystem with RFID Security and Environmental Monitoring**. *(PEEIACON 2024 - IEEE Power, Energy and Innovations Conference)*.
- **Revolution in Campus Transportation: The Autonomous Electric Vehicle With Smart Features**. *(ICPS2023 - IEEE Intl. Conference on Electrical & Power Systems)*.
- **Development of a Portable Dual-Verification Biometric Attendance System for Real-Time Monitoring**. *(Springer - International Conference on Machine Intelligence and Emerging Technologies)*.

Selected Technical Projects

- **ORCA Autonomous Underwater Vehicle (AUV):** Led embedded systems design for an AUV, focusing on underwater sensor integration, real-time communication, and control algorithms. This project was selected for the Singapore AUV Challenge (SAUVC 2025), representing Bangladesh among 25+ countries.
- **Low-Latency Mini Drone:** Built a custom PCB drone with an ESP32-S3 and camera for low-latency video streaming, tested in remote monitoring scenarios. The project was featured as the Star project of the Open Source Hardware Lab(OSHWLAB)
- **LoRa Messaging Device:** Implemented a secure, long-range(Nearly 5 km) IoT communication system at a very low cost with a custom antenna.
- **Advanced Line Follower Robot:** Developed a multi-modal robot with PID control capable of high-speed line-following and custom maze navigation, featuring an interactive display for on-the-fly mode selection.

Leadership & Volunteering Experience

President, RoboSUST – Volunteering Robotics Club of University Mar 2023 – June 2025

- Led 60+ members of the Robotics Club. Organized 3 national-level workshops and 2 outreach programs, training 100+ students in robotics and IoT with hands-on embedded systems experience. Mentored 2 teams to win the Robotic Contest.

Robotics & PCB Design Trainer Apr 2023 - Sep 2024

- As a certified EasyEDA trainer, trained 200+ students in advanced PCB design through a 3-day national workshop series in collaboration with EasyEDA.

Technical Skills

- **Programming & ML:** C/C++, Python, Dart, MATLAB, TensorFlow Lite, Edge Impulse
- **Embedded Hardware:** STM32, ESP32, Arduino, Raspberry Pi, Jetson Nano
- **EDA & Simulation:** Altium, EasyEDA, LTspice, Proteus, Simulink
- **Protocols & Architectures:** RTOS, SPI, I2C, UART, CAN Bus, High-Speed PCB Design

Honors & Awards

- **Winner** (Team Lead), JRC Board Hackathon(IoT in Industry), Developed IoT-enabled Energy Monitoring System in 24 hours, 2023
- **2nd Runner-Up** (Team Lead), Line Follower Robot Contest, 2023
- **International Contest**, Represented Bangladesh among 25+ countries, 50+ teams in the Singapore AUV Challenge.