MD RAKIB HASSAN DIPU

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PROFESSIONAL SUMMARY

Undergraduate IoT and Robotics Engineering student (**Level 4, Term 1 / 4.1**) with a strong focus on Embedded Systems, Edge AI, and Machine Learning. Proven research track record with an **IEEE-indexed conference publication** on assistive IoT healthcare and an accepted paper on deterministic RTOS railway safety. Experienced in building end-to-end hardware-software platforms, on-chip signal processing (1024-pt FFT), and transformer pipelines. Seeking engineering and research roles to develop scalable, real-world intelligent systems.

EDUCATION

University of Frontier Technology, Bangladesh (UFTB) *Kaliakair, Gazipur, Bangladesh*
Bachelor of Science in IoT and Robotics Engineering – ***Level 4, Term 1 (Ongoing)*** *Expected Aug 2027*

- **Core Domains**: Embedded Systems, Real-Time Operating Systems (RTOS), Edge AI, Robotics Kinematics, Digital Signal Processing (DSP), Sensor Fusion, and Intelligent Automation.

MC College, Sylhet *Sylhet, Bangladesh*
Higher Secondary Certificate (HSC) – Science ***GPA: 5.00 / 5.00*** *Passed 2022*

Sylhet Government Pilot High School *Sylhet, Bangladesh*
Secondary School Certificate (SSC) – Science ***GPA: 5.00 / 5.00*** *Passed 2020*

TECHNICAL SKILLS

- **Programming Languages**: Python, C++, C, SQL, ROS, Shell Scripting, PHP
- **Embedded Systems & IoT**: ESP32, ESP32-S3, ESP32-CAM, FreeRTOS, FSM Control, Microcontrollers, Wi-Fi CSI Sensing, Sensor Protocols (I2C, SPI, UART), GSM (SIM800L), MQTT, Arduino
- **AI, ML & Data Science**: PyTorch, TensorFlow, Scikit-learn, Hugging Face Transformers (BART), Faster-Whisper (CTranslate2), OpenCV, Pandas, NumPy, Matplotlib, Signal Processing (1024-pt FFT)
- **Hardware & Circuit Design**: EasyEDA, Altium Designer (Schematic & Multi-layer PCB), SolidWorks (3D CAD), AutoCAD
- **Tools, Platforms & OS**: Git, GitHub, Linux, VS Code, Jupyter Notebook, Flask, SQLite3, Cisco Packet Tracer

FEATURED ENGINEERING PROJECTS

Bridge Structural Health Monitoring (SHM) & Digital Twin Platform

ESP32-S3, Edge FFT, Digital Twin, Python

- Built an IoT structural health monitoring system using ESP32-S3 and 9-DOF MEMS sensors (MPU9250) to continuously capture micro-vibrations, acceleration shifts, and structural stresses.
- Implemented on-chip 1024-point Fast Fourier Transform (FFT) on streaming acceleration data for real-time resonance anomaly detection and predictive micro-crack alerting before visible damage.
- Developed a live 3D digital twin dashboard displaying real-time stress heatmaps and low-latency safety triggers.

AI Video Summarizer & Multimodal Pipeline

Faster-Whisper, BART Transformer, PyTorch, Flask

- Developed an end-to-end multimodal transcription and abstractive summarization web application for YouTube URLs and video files.
- Accelerated speech-to-text inference 4–5× using Faster-Whisper with CTranslate2 int8 quantization and multi-threaded CPU/GPU execution.
- Integrated Hugging Face BART (`facebook/bart-large-cnn`) with semantic token chunking, clickable timestamp navigation [mm:ss], and MD5-based media caching.

TravelBD – Intelligent Dijkstra Highway Routing & Booking Platform

C++ OOP 2.0, Graph Theory, SQLite3

- Implemented highway shortest-path routing across 21 Bangladesh districts using Dijkstra's algorithm with dynamic waypoint reconstruction and fare calculation.
- Architected a modular C++ OOP 2.0 engine leveraging Strategy Pattern and runtime polymorphism for multi-channel digital payments (bKash, Nagad, Cards) and interactive SVG route mapping.

PUBLICATIONS & RESEARCH

- **MD Rakib Hassan Dipu**, et al., "**Lightweight IoT-Driven Panic Attack Detection and Caregiver Alert System for Autism Spectrum Disorder**," *2025 IEEE 4th International Conference on Robotics, Automation, Artificial Intelligence, and Internet-of-Things (RAAICON)*, MIST, Dhaka, Bangladesh. Published & indexed on IEEE Xplore.
- **MD Rakib Hassan Dipu**, Saurav Chandra Das, "**RTOS-Based Intelligent Railway Level Crossing System Using ESP32-S3**," *International Conference on Electrical, Computer and Communication Technology (ECCT 2026).* Accepted for publication in **Taylor & Francis Books** and selected for oral presentation.
- **MD Rakib Hassan Dipu**, et al., "**Design and Implementation of a Hybrid IoT-Based Emergency SOS Alert System Using GSM and MQTT Communication**," Submitted for peer-reviewed journal publication (2026).

ADDITIONAL RESEARCH & EMBEDDED PROJECTS

IoT-Driven Assistive Panic Attack Detection System for Autism (ASD) *ESP32-CAM, Machine Learning, GSM/MQTT*

- Designed non-intrusive physiological sensor fusion (HRV, Galvanic Skin Response) and edge camera monitoring to detect early panic attack patterns in individuals with ASD.
- Engineered dual-channel alert dispatch (GSM SMS and MQTT broker) notifying caregivers within seconds while triggering soothing ambient cues (adaptive lighting and calming acoustics).

RTOS-Based Intelligent Railway Level Crossing Safety Platform *ESP32-S3, FreeRTOS, FSM Control*

- Engineered a deterministic safety platform decoupling sensor acquisition, obstacle verification, gate motor actuation, and signaling into dedicated prioritized FreeRTOS tasks.
- Implemented a Finite State Machine (FSM) eliminating race conditions and ensuring zero-latency fail-safe defaults under noisy operational environments.

SmartSpiro – AI & IoT-Assisted Intelligent Spirometry System *IoT Sensors, Machine Learning, Telehealth*

- Developed a low-cost spirometry screening device integrating pressure sensors and lightweight ML classifiers for early respiratory risk screening and remote patient monitoring.
- Selected as an **ImpactX 2026 Finalist** for accessible digital healthcare innovation.

HONORS & AWARDS

- **Finalist – ImpactX 2026**: Recognized for *SmartSpiro*, an AI- and IoT-enabled intelligent spirometry device for early respiratory risk screening.
- **1st Runner-Up – Hult Prize Campus Competition 2025**: Awarded for sustainable, tech-driven social enterprise venture addressing UN Sustainable Development Goals (SDGs).
- **Google Cloud Computing Scholarship Recipient**: Awarded for demonstrating technical merit in cloud architectures.
- **21st Century Employability Skilling Program (Intermediate)**: Certified by Wadhwani Foundation in agile execution and professional problem-solving (2025).
- **PCB Designing Workshop & Contest**: IEEE RAS IUT Student Branch certification in schematic design and DRC verification in EasyEDA & Altium Designer (2025).

LEADERSHIP & COMMUNITY ENGAGEMENT

- **Joint General Secretary** – *National Children's Task Force (NCTF)* (Jan 2021 – Dec 2022)
  - Directed child rights monitoring operations across Bangladesh; mobilized a nationwide network of 40,000+ youth members in 64 districts.
  - Spearheaded national advocacy campaigns and represented youth in high-level policy dialogues with government ministries and Save the Children.
- **President / Organizing Secretary** – *BADHAN (Voluntary Blood Donors' Organization), UFTB Unit* (Feb 2026 – Present)
  - Directing voluntary blood donor campaigns, blood grouping camps, and 24/7 emergency patient blood supply logistics across the university unit.
- **Deputy Organizing Secretary & Techathon Coordinator** – *UFTB Robotics Club* (Dec 2025 – Present)
  - Coordinated the flagship national robotics festival *ROBOFUSION 1.0* (BDT 150K+ prize pool across LFR, Robo Soccer, and Techathon).
- **Former Senior Patrol Leader** – *Sylhet Government Pilot High School Scout Team*
  - Led scout patrols in drills, community relief drives, camping expeditions, and emergency preparedness training.