

Pabitra Majhi

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SUMMARY

Embedded Systems and IoT Engineer with hands-on experience developing production-grade firmware, custom PCB hardware, and real-time telemetry pipelines. Proficient in C/C++, ESP-IDF, FreeRTOS, and Linux-based development environments. Experienced in multi-threading, MQTT communication, sensor driver development, and OTA update mechanisms. Passionate about embedded software engineering, device driver work, and solving low-level hardware-software integration challenges in cross-functional team settings.

TECHNICAL SKILLS

Programming Languages: C, C++, Python, Verilog, MicroPython

Embedded Frameworks & RTOS: ESP-IDF, FreeRTOS, Arduino IDE, LVGL (UI), Embedded C

Linux & Systems: Linux internals, multi-threading, UART/SPI/I2C interfaces, TCP/IP fundamentals

Hardware Design: KiCAD (PCB Design), sensor interfacing (gas, dust, climate), ADC calibration, prototype assembly, soldering

IoT & Connectivity: MQTT, OTA firmware updates, Node-RED, Supabase, JSON telemetry

Development Tools: Git/GitHub, Xilinx Vivado, debuggers, compilers, version control systems

Testing & Diagnostics: Python-based load testing, system diagnostics, NVS-based calibration persistence

EXPERIENCE

IoT Engineer Intern

SentioAir

February 2026 – April 2026

Pune, Maharashtra, India

- Developed embedded software for an end-to-end environmental monitoring system using ESP32-S3 and ESP-IDF, implementing a modular FreeRTOS multi-tasking architecture with a queue-driven state machine for synchronized sensor data handling.
- Wrote high-performance C-based device drivers for MQ-series gas sensors, DHT22, and Sharp Dust Sensor, incorporating calibrated ADC readings with curve-fitting and NVS-based calibration persistence to ensure data accuracy.
- Implemented a robust OTA (Over-the-Air) firmware update mechanism with boot-time validation and health checks, reducing risk of firmware bricking during remote deployments.
- Validated backend scalability by conducting MQTT load testing with a Python-based simulator, successfully stress-testing from 50 to 500 virtual concurrent devices at 50 ms intervals with 0% message loss and stable CPU usage under 9%.
- Designed and integrated a real-time graphical UI using the LVGL library on an SPI touch display, providing localized diagnostics and live sensor telemetry.
- Designed a custom PCB in KiCAD transitioning the prototype from breadboard to a production-ready form factor, optimizing signal integrity for analog sensor paths.
- Architected a complete data pipeline (Device → MQTT → Node-RED → Supabase → Dashboard) for real-time visualization and SaaS integration.

Project Engineer (Hardware)

NIT Durgapur

May 2024 – June 2025
Durgapur, West Bengal, India

- Developed 10+ microcontroller-based sensor drivers (temperature, gas, noise) in C and MicroPython, improving data reliability by 18%.
- Designed and assembled 4+ prototype PCBs using modular development frameworks, cutting assembly time by 25%.
- Engineered a multi-sensor environmental monitoring unit with real-time AQI computation powered by lightweight AI models, achieving 95% system uptime through AI-driven sensor health diagnostics.
- Reduced component costs by approximately 40% through component optimization without performance loss.
- Collaborated with a 5-member cross-functional team spanning hardware, ML, and data systems to deliver end-to-end working prototypes.
- Managed vendor procurement and reimbursement of lab materials valued at ~INR 1 Lakh, ensuring 100% compliance with project deadlines.
- Built 3D-printed enclosures for live demonstrations and field testing, enhancing prototype durability in public settings.

PROJECTS

I-PolluSense: Intelligent Air and Noise Pollution Sensing System

May 2024 – June 2025

- Developed a cost-effective real-time pollution monitoring system measuring CO₂, CO, TVOC, PM2.5, PM10, and noise profiles using embedded C and MicroPython drivers on microcontrollers.
- Integrated AI-enhanced AQI calculation and sensor health monitoring, achieving dynamic Air Quality Index readings tailored to real-world environmental conditions.
- Designed hardware for broad accessibility, balancing affordability with advanced monitoring functionality.

Xilinx FPGA-Based VLC Development Kit

April 2023 – June 2024

Final Year B.Tech Project

- Designed UART-based data transmission logic routing output through an LED driver to transmit data as high-frequency invisible light pulses.
- Developed Verilog-based FPGA logic for data encoding, decoding, and processing on a Xilinx development board using Xilinx Vivado; integrated OPT101 ambient light sensor on the receiver side.
- Built a C# Windows application to control transmitted data, monitor communication status, and display received data packets in real-time.

EDUCATION

Bachelor of Technology in Computer Science and Engineering

June 2024

Budge Budge Institute of Technology, Budge Budge, Kolkata

Cumulative GPA: 8.87 / 10.0