ABUBAKAR ZUBAIR OKAHYOLE

+234 813 818 8291 | abubakar.o.zubair@gmail.com | LinkedIn | GitHub | Nigeria
Portfolio: **https://al-ibiewi.github.io/abubakarzubair/**

RESEARCH INTERESTS

My research sits at the convergence of embedded intelligence, sensing systems, and human-centred design — with a unifying commitment to building systems that are affordable, offline-capable, and impactful in low-resource environments. I am drawn to the following interconnected areas:

1. **Edge Intelligence & Efficient TinyML:** Deploying machine learning inference on severely resource-constrained embedded hardware — enabling real-time, intelligent decision-making without cloud dependency or reliable internet access.
2. **Intelligent Sensing Systems for Food Security:** Developing low-cost embedded acoustic, environmental, and multi-modal sensing solutions to prevent post-harvest crop losses and support food system resilience in low-income agricultural settings.
3. **Embedded Intelligence for Health & Bio-Innovation:** Designing smart, embedded assistive devices for patients and underserved communities — with a focus on offline-first systems that operate reliably in healthcare settings with limited infrastructure.
4. **Offline-Capable IoT Architectures:** Architecting robust, self-contained IoT systems — integrating wireless sensing, local data processing, and edge communication protocols — for deployment in environments where connectivity cannot be assumed.
5. **Real-Time Embedded Systems for Safety-Critical Applications:** Investigating real-time, safety-critical embedded system design — including embedded networking, sensor fusion, and deterministic firmware — for applications in health monitoring, industrial control, and assistive technology.

EDUCATION

B.Eng. Electrical Engineering *Expected: July 2026*

Bayero University, Kano (BUK) — Kano State, Nigeria

CGPA: 4.27 / 5.00 *(Level 500, Semester 1: **4.89 / 5.00** — final results pending)*

FINAL YEAR PROJECT

Offline Voice Assistant System for Hospitals *Jan 2026 – Present*

Designed and developed a fully offline, voice-controlled assistive IoT device targeting hospital patients and individuals with special needs. The system uses an ESP32 microcontroller integrated with natural language processing to interpret spoken commands without internet connectivity. A SIM800 GSM module enables offline emergency alert dispatch via SMS, while a companion mobile application provides caregivers with real-time notifications and remote control. The project was nominated for the Innovation to Market (i2M) Programme with funding consideration of up to ₦2,000,000 for patent development and commercialisation.

Technologies: ESP32, SIM800 GSM Module, Embedded C/C++, Arduino IDE, Mobile App Integration

PUBLICATIONS

1. **SiloGuard: A Low-Cost TinyML-Enabled Solar Granary for Post-Harvest Loss Prevention in Nigeria**
   Manuscript under review — Nestec Journal | 2026
2. **Offline Voice-Controlled Home Assistant**

Manuscript in preparation — submission pending final year defence | 2026

TEACHING & MENTORSHIP

SIWES Intern Mentor — Embedded Systems *Jan 2025 – July 2025*

GESEL Engineering Services Ltd. · Kano State, Nigeria

- Formally mentored the incoming SIWES 1 cohort in embedded systems fundamentals, electronics hardware repair, and DC motor control — bridging classroom theory and industry practice.
- Designed hands-on lab exercises covering microcontroller programming, circuit assembly, and component testing; assessed intern progress and provided structured feedback.

Embedded Systems Bootcamp — Instructor & Organiser *2025 – 2026*

Nigerian Institution of Electrical & Electronics Engineers (NIEEE) — BUK Branch

- Independently designed and delivered a two-day Embedded Systems Bootcamp for students with zero prior experience, covering hardware fundamentals through to microcontroller simulation.
- Managed all aspects of delivery: curriculum design, hands-on demonstrations, participant support, and post-event feedback collection.

Freelance Engineering Tutor *2025*

Private Instruction · Remote & On-site

- Delivered one-on-one and small-group tuition in core Electrical Engineering subjects to students at private universities across Nigeria.
- Adapted teaching style and pacing to individual learners, with consistent positive feedback on clarity and technical depth.

Peer Tutor & Study Group Leader *2020 – 2023*

Department of Electrical Engineering, Bayero University Kano

- Voluntarily tutored classmates in challenging core courses throughout the early years of the programme, developing strong pedagogical instincts through sustained practice.
- Led structured study groups, created revision materials, and consistently received praise for the clarity and accessibility of explanations.

WORK EXPERIENCE

Embedded Systems Engineer Intern & Mentor (SIWES 2) *Jan 2025 – July 2025*

GESEL Engineering Services Ltd. · Kano State, Nigeria (On-site)

- Taught and mentored the new SIWES 1 intake in embedded systems, electronics hardware repairs, and control systems with DC motor programming.
- Designed and implemented an ESP32-based DC motor speed control system using a potentiometer and DRV8833 motor driver, enabling real-time PWM speed regulation.
- Developed and debugged firmware in Arduino IDE; conducted load testing to ensure stable motor operation under varying conditions.
- Explored and implemented IoT integration solutions for energy and software engineering projects.
- Supported solar system design, analysis, and installation workflows; contributed to R&D initiatives.
- Assisted in embedded system prototyping, circuit assembly, component testing, and technical documentation.

Electrical Engineering Intern (SIWES I) *2024 · 3 months*

Dez & Knights Energy Resources Ltd. · Edo State, Nigeria (On-site)

- Participated in the manufacture and repair of inverter systems and associated power electronics.
- Assisted with the installation and commissioning of solar energy systems.
- Gained hands-on experience in electronics repair and testing of electrical equipment.

Freelance Technical Developer *2023 – Present*

Self-Employed · Remote

- Designed and deployed automated digital systems for SMEs using WordPress and integrated automation stacks.
- Built workflow automation pipelines using n8n and Airtable for operational data handling and efficiency.
- Applied problem-solving and system optimisation skills transferable to embedded automation contexts.

PROJECTS

SiloGard — Acoustic Post-Harvest Crop Management Device *Dec 2025 – Present*

Engineered a low-cost embedded device to detect insect infestation and environmental anomalies in grain silos using acoustic sensing. Integrated an ESP32 microcontroller with an INMP441 MEMS microphone for precise acoustic data acquisition and trained an embedded machine learning classification model (TinyML) using Edge Impulse. Won First Runner-Up at the Hult Prize Competition (BUK Branch 2025); nominated for the Nigerian national phase.

Technologies: ESP32, INMP441 Microphone, TinyML / Edge Impulse, Embedded C/C++, IoT Architecture

Industrial WiFi-to-CAN-Bus Adapter *2025*

Architected and fully documented a custom industrial-grade PCB in KiCad bridging wireless connectivity with CAN-Bus communication protocols. Focused on signal integrity, noise immunity, and readiness for localised "Made in Nigeria" manufacturing.

Technologies: KiCad (PCB Design), CAN-Bus Protocol, ESP32, Signal Integrity Analysis

The Digital Diya *2025*

Designed the complete custom PCB layout in KiCad for an ornamental smart lighting device, covering schematic capture, component placement, and routing.

Technologies: KiCad, ESP32, PCB Design

AWARDS & RECOGNITIONS

MTN Foundation Scholar *2023 – 2026*

Awarded the highly competitive MTN Foundation Scholarship for academic excellence. Renewed annually on the basis of sustained academic performance — maintained for all three renewal cycles (2023, 2024, 2025).

Innovation to Market (i2M) Programme — Nominee *2025 – Present*

Final year project (Offline Voice Assistant for Hospitals) selected for the i2M Programme offering up to ₦2,000,000 in funding, professional mentorship, and support for patent filing and commercialisation.

First Runner-Up — Hult Prize Competition (BUK Branch) *2025 – Present*

SiloGard post-harvest monitoring device awarded First Runner-Up at the institutional Hult Prize round. Project nominated for the Nigerian national phase.

Best Student Award — Department of Electrical Engineering *2019/2020*
Recognised as the best student in the Department of Electrical Engineering for the 2019/2020 academic session.

CERTIFICATIONS

An Introduction to Programming the Internet of Things (IoT) *2025 – Present (In Progress)*
University of California, Irvine · Coursera Specialisation

TECHNICAL SKILLS

Programming Languages: C, C++, Embedded C (Arduino), Python (basic), MATLAB, HTML, CSS, JavaScript (basic), PHP (basic)

Hardware Platforms: ESP32 / ESP32-C3, Arduino (Uno, Nano), Raspberry Pi, STM32, DRV8833 Motor Driver, SIM800 GSM Module, INMP441 MEMS Microphone

Embedded & IoT Tools: Arduino IDE, KiCad (PCB Design), Proteus (Simulation), MATLAB / Simulink, Edge Impulse (TinyML), STM32CubeIDE, Git / GitHub, n8n, Airtable

Productivity & Design Tools: Microsoft Office Suite (Word, Excel, PowerPoint), Google Workspace (Docs, Sheets, Slides, Forms), SPSS (Statistical Analysis), Figma, Canva

Domains: Embedded Systems, IoT Architecture, TinyML / Edge AI, PCB Design, Motor Control, Wireless Systems, Power Electronics, Web Automation

Analytical & Professional Skills

- Systems thinking and end-to-end embedded architecture design — from component selection and schematic capture to firmware development and field deployment.
- Problem decomposition and root cause analysis — experienced in diagnosing hardware faults, firmware bugs, and system integration failures under time constraints.
- Data interpretation and reporting — able to translate experimental results, sensor data, and system behaviour into clear technical documentation and actionable insights.
- Experimental design and hardware validation — structured approach to load testing, component characterisation, and iterative prototyping.
- Technical documentation and research writing — experience preparing manuscripts, project reports, and instructional materials for both academic and professional audiences.

Leadership & Communication Skills

- Curriculum design and technical instruction — designed and delivered a two-day Embedded Systems Bootcamp from scratch, taking complete beginners to hands-on microcontroller simulation.
- Mentorship and coaching — formally mentored SIWES interns in embedded systems, electronics repair, and motor control at GESEL Engineering Services.
- Student representation and academic coordination — elected class representative for five consecutive years, serving as the formal bridge between students and faculty.
- Cross-functional communication — experienced working across engineering, research, and community-facing contexts, adapting technical language for varied audiences.

LEADERSHIP & EXTRACURRICULAR ACTIVITIES

Class Representative & Monitor *2020 – 2026*

Department of Electrical Engineering, Bayero University Kano

Served as the elected class representative and academic monitor throughout the entire five-year undergraduate programme. Acted as the primary liaison between students and faculty, coordinated class activities, and maintained academic records and communication.

Special Assistant in Technology (S.A. Technology) *2025 – 2026*

Nigerian Institution of Electrical & Electronics Engineers (NIEEE) — BUK Branch

- Appointed to the role by the branch president; received a Certificate of Excellence upon completion of tenure.
- Designed promotional materials and communications for branch activities and events.
- Organised and delivered a two-day Embedded Systems Bootcamp — taking participants with no prior experience through hardware fundamentals to simulating their first microcontroller project.

Member, International Association of Engineers (IAENG) *2026 – Present*

- IAENG Society of Electrical Engineering
- IAENG Society of Artificial Intelligence
- IAENG Society of Internet Computing and Web Services

CONFERENCES & WORKSHOPS ATTENDED

NIEEE-BUK Annual 1-Day Engineering Workshop *2024 / 2025*

Nigerian Institution of Electrical & Electronics Engineers — BUK Branch

NIEEE-BUK Annual 1-Day Engineering Workshop *2025 / 2026*

Nigerian Institution of Electrical & Electronics Engineers — BUK Branch

REFERENCES

Prof. Bala Boyi Bukata *Project Supervisor*

Professor & Head of Department — Electrical Engineering, Bayero University Kano (BUK)

+234 802 915 4174 | bbbukata.ele@buk.edu.ng

Prof. Nuradeen Magaji *Level Coordinator*

Professor & Senior Lecturer — Electrical Engineering, Bayero University Kano (BUK)

+234 803 185 0106 | nmagaji.ele@buk.edu.ng

Dr. Ibrahim Haruna Shanono (SMIEEE)

Senior Lecturer — Electrical Engineering, Bayero University Kano (BUK)

+234 803 653 3321 | ishanono.ele@buk.edu.ng

LANGUAGES

English — Native / Bilingual Proficiency **Arabic** — Professional Working Proficiency