ERNEST TOOCHUKWU SAMUEL

Ogun State, Nigeria | : +234-706-459-7476 | : samuelernest91@gmail.com |
: https://www.linkedin.com/in/ernest-samuel001/

IoT & Smart Sensing | Industrial Plant Automation | Structural Health Monitoring | Predictive Maintenance | Distributed Intelligence

PROFESSIONAL SUMMARY

Engineering professional with research interest in improving how we monitor and assess infrastructure assets. My work so far has combined hands-on experience in automation and sensor-based condition monitoring with graduate training in mechatronics and applied machine learning. In my TinyML thesis, I researched and developed a lightweight TCN model that predicts bearing temperature anomalies ahead of failure on an edge device. Demonstrating how simple, fast, and edge-based models can enhance maintenance reliability and proactiveness. I am increasingly interested in how graph-based and stochastic ways of modelling can support reliable, real-time decisions. My background in analysing sensor trends, detecting anomalies, and understanding practical equipment behaviour has shaped this interest. I am eager to contribute to the development of scalable monitoring and decision-support systems.

EDUCATION

Master of Advanced Studies (MAS ETH) in Mechatronics Engineering **Jan. 2022- Dec.2024**

Swiss Federal Institute of Technology Zurich, Switzerland **Grade: GPA: 5.34/6 (2:1 UK NARIC)**

Courses

Computational Methods | Dynamics Mechanics | Embedded Systems & Computer Programming | Mathematical tools I & II | Signals and systems | Static & Solid Mechanics | Thermofluids | Digital Electronics |

Academic Activities

- **Funding award:** Received a fully funded Holcim Scholarship for a dual master's program.
- Completed a six-month industry internship at Holcim as an Automation and Instrumentation Intern, receiving a high-performance rating.
- Awarded the "Most Engaging Student" for the 2022/2023 academic session.
- Nominated to present at the Engineering Diaries Conference at Ashesi University, delivering a presentation on the student experience within the ETH–Ashesi master's program.

Master of Science (MSc.) in Mechatronics Engineering **Jan. 2022- Dec.2024**

Ashesi University, Ghana **Grade: CGPA: 3.46/4 (2:1 UK NARIC)**

Courses

Data Analysis & ML | Analysis & Design of Control Systems Identification & Modelling | Leading Teams | Investment Appraisal & Cost-Effectiveness Analysis | Manufacturing Processes | Optimal Control | Reliability and Risk | Energy Systems & Mobility | Robotics and Mechatronics | Product Development | Adv. Communication Systems & IoT |

Academic Activities

- **Funding Award**: Received a fully funded Holcim Scholarship for a dual master's program.
- Received the Best Poster Presentation Award in Development Economics for the work titled "As Poor as Burundi."
- Volunteered as a graduate guidance for the University of Nottingham's secondary school student engineering competition.
- Founded and led the Army Club, an initiative designed to help Ashesi University students develop coding and problem-solving skills.
- Founded Panakenergy, a green energy solution, and was selected among the top three business pitches by the Global Impact Accelerator Corporation as part of the Ashesi Entrepreneurship Acceleration Program.

Bachelor of Engineering (B.Eng.) in Mechanical Engineering **Nov. 2014 - Sept. 2019**

University of Nigeria, Nsukka, Nigeria **Grade: CGPA: 4.18/5 (2:1 UK NARIC)**

Courses

Engineering Mathematics | Strength of Materials | Engineering Material Selection | Heat & Mass Transfer | Fluid Mechanics | Thermodynamics | Engineering Design | Measurement & Instrumentation | Electrical Engineering

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RESEARCH AND PROJECTS

- **Master's Thesis:** TinyML Anomaly Detection and Fault Prediction for Industrial Applications - *Supervised by: Prof. Magno Michele, Dr Tommaso Polonelli, and Engr. Adedeji Esan*
- **Bachelor's Thesis:** Energy Analysis of Domestic Cookstoves in Nigeria - *Supervised by: Prof. G. O. Unachukwu*
- Transient Thermal Analysis of Break Disc Using Static Ring Heat Source – *Supervised by: Dr Elena Rosca*
- Renewable Energy Technology in South Africa; Opportunities and Potentials – *Supervised by: Dr Heather Beem*
- PID controller for ball-balancing system – Supervised by: Prof. Brad Nelson
- Cement Mill Process Control System Upgrade: Siemens PCS migration, sensor validation, control logic restructuring.
- AI Cement Bag Counter & Condition Monitoring System: Industrial IoT, Computer vision, Server management
- Developed and deployed 6+ fully functional websites, including portfolios, e-commerce platforms with online payment/shipping integration.

CORE COMPETENCIES

Soft Skills: Cross-disciplinary collaboration | Scientific communication | Analytical reasoning | Problem-solving | Adaptability in multicultural environments | Documentation and reporting | Team coordination | Attention to detail | Project leadership

Industrial Engineering: Structural Health Monitoring (SHM) | Automation & Process Control (PLC & SCADA) | Preventive maintenance | Root cause analysis & troubleshooting | Energy assessments & plant audits | Instrumentation, calibration & commissioning | Technical presentations & solution selling

Analytical Skills: Signal Processing | Time-Series Modelling | Anomaly Detection | Feature Engineering | Uncertainty Quantification | SHM Diagnostics | Root Cause Analysis

Tools & Software: Python | MATLAB | TIA Portal | GitHub | LaTeX | AutoCAD | NX | CSS/HTML |MS Office | Appollo |PCS7

WORK EXPERIENCE

Automation Engineer

Lafarge Africa Plc. ***Feb 2025 – Present***

- Designed and implemented logic-based monitoring frameworks to track temperature, pressure, chemistry, process airflow, and material transport, enabling early detection of deviations and improved fleet-wide quality control.
- Enhanced alarm diagnostics and reduced mean response time by 23% through improved signal mapping and operator support logic.
- Led the Cement mill Process Control System (PCS) upgrade from Allen Bradley to Siemens PLCs; validated sensors, actuators, and signal integrity for distributed monitoring reliability.
- Reproduced missing PLC documentation (102-page set), improving model transparency and decision support for operations.
- Utilised M-Predict (AI-based SHM & dynamic monitoring tool) for early failure prediction, enabling preventive maintenance to address root causes.
- Conducted structural health monitoring of critical rotating equipment using vibration, temperature, and operational data trends, contributing to a 15% increase in MTBF and a 9% reduction in unplanned stoppages.

Corporate Industrial Masters Intern

Holcim Group, Nigeria ***July 2024 – Jan. 2025***

- Developed and deployed an AI-based risk assessment platform, improving documentation efficiency and reducing risk evaluation time significantly and directly supporting audit-readiness.
- Built a TinyML-based model for real-time cement mill bearing anomaly detection, improving predictive maintenance capability.
- Programmed and configured PLC, SCADA/HMI systems for consistent monitoring and data acquisition. Developed SOPs to facilitate operational use and maintenance.
- Participated in root cause analyses contributing to a 17% increase in monthly dispatch efficiency.

Data Preprocessing Engineer

Kwame AI, Accra ***May 2023 – Jan 2025***

- Developing and implementing data preprocessing pipelines for AI training using various techniques, including data

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scraping, video cropping, and textbook parsing

- Collaborated with a multidisciplinary team and Contributed scripts and documentation to the open-source NSMQ AI GitHub repository.
- Ensured compliance with ML engineering best practices and data preprocessing code.

Operations & Maintenance Engineer
ICE Commercial Power ***Jan. 2021 – Jan. 2022***

- Maintained a 95.5% uptime across 10 rural mini-grid power systems by ensuring rapid emergency response and preventive maintenance scheduling.
- Managed end-to-end execution of 12+ solar system installations (5–10 KVA) across 3 states in Nigeria, overseeing all phases from planning to commissioning, ensuring high-quality deliverables and timely completion.
- Led investigations into 12+ safety incidents, identifying root causes and deploying corrective actions that reduced recurrence by 45%.
- Conducted bi-weekly site safety audits and over 60 equipment inspections to ensure compliance with internal HSE and regulatory guidelines.

CERTIFICATIONS

- Industrial Automation & Robotics - Holcim
- Industrial OT/IT Cybersecurity Awareness - Holcim
- AI & Machine Learning Certifications - Holcim
- Soft Skills & Business Communication - Jobberman
- Jira for Project Management - Coursera Project
- COREN Certified Engineer - COREN
- Energy Transition; Innovation Towards a Low-Carbon Future | IFP SCHOOL-COLLEGE, FRANCE

MEMBERSHIP, LEADERSHIP AND AWARDS

- 2024 – Present | Corporate Member of Nigerian Society of Engineers (NSE)
- 2022 –2023 | Graduate Student Award (Most Engaging Student of the Year) | Ashesi University, Ghana
- 2022 –2023 | Vice President, International Students Association (ISA) | Ashesi University, Ghana
- 2022 –2023 | Vice President, ARM MCU Student Developers Club | Ashesi University, Ghana

REFERENCE

Prof. Dr. Michele Magno
Director of the D-ITET Centre for Project-based Learning
Senior Researcher and Pirvatdozenten
ETH Zurich, Switzerland
Relationship: Master's Thesis Supervisor
Email: michele.magno@pbl.ee.ethz.ch
Phone: +41446326686
LinkedIn: https://www.linkedin.com/in/michele-magno-20b981a/

Engr Adedeji Esan
Plant Manager
Lafarge Africa Plc., Huaxin Cement Co. Ltd., Shagamu, Nigeria
MPhil, Manufacturing Engineering
University of Bradford, England
Relationship: Industrial Supervisor and Mentor
Email: adedeji.esan@lafarge.com
Phone: +2348086197392
LinkedIn: https://www.linkedin.com/in/adedejiesan/

Prof. Dr. Florian Dörfler
Deputy Head of Automatic Control Laboratory
Recipient of the 2025 Rössler Prize
ETH Zürich, Switzerland
Relationship: MAS ETH Lecturer
Email: doerfler@control.ee.ethz.ch
Phone: +41446327288
LinkedIn: https://www.linkedin.com/in/florian-dorfler-a8852258/

Prof. Dr. Nathan Amanquah
Dean of Engineering, Faculty of Engineering
Senior Lecturer, Electrical Engineering Department
Ashesi University, Ghana
Relationship: MSc. Ashesi Lecturer
Email: namanquah@ashesi.edu.gh
Phone: +233243173097
LinkedIn: https://www.linkedin.com/in/nathan-amanquah-33478323/