Glen Muthoka Mutinda

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⦿ Bananz0

Professional Summary

Final-year Electrical & Electronics Engineering student at the University of Southampton with specialization in embedded systems, IC design, and cybersecurity. Maintain 69 GitHub repositories spanning public open source, private work, and forks (not all contributions are mirrored publicly). Proven track record in both hardware and software development, from Ring Oscillator design for real-time clock chips at TSMC 65nm to real-time FPGA systems and full-stack applications. Experience includes space-grade software development for lunar CubeSat missions and AI-driven optical authentication research, achieving measurable improvements in system performance and reliability. Seeking graduate opportunities in embedded systems engineering, digital design, or firmware development.

Education

University of Southampton   **Southampton, UK**
BEng Electrical & Electronics Engineering (Expected First Class Honours)   *2023–2026*
Key Modules: Digital Systems Design, Integrated Circuit Design, Control Systems, Embedded Systems, Network Security, Signal Processing
Second Year Project: TSMC 65nm Ring Oscillator for Real-Time Clock IC (Team Lead)
Final Year Project: AI-Driven Optical Authentication Framework using Optical PUFs (Lead Researcher & Developer)

ONCAMPUS Global   **Southampton, UK**
Undergraduate Foundation Programme, Engineering Pathway (Distinction)   *2022–2023*

Moi Forces Academy   **Nairobi, Kenya**
Kenya Certificate of Secondary Education   *2018–2022*

Professional Experience

ARTEMIS Small Sat-1 Lunar CubeSat Project   **University of Southampton**
Junior Software Engineer   *Sep 2023–Jun 2025*
- Developed and optimized flight software in C/C++ for lunar mission CubeSat, reducing system latency by 6% through algorithm optimization and code refactoring
- Enhanced system reliability by 20% through implementation of comprehensive unit testing frameworks and automated debugging procedures
- Collaborated with multidisciplinary team of 8 engineers to deliver space-grade software meeting strict timing and safety requirements
- Conducted code reviews and documentation following NASA coding standards and MISRA C guidelines
- Implemented real-time telemetry processing system for ground station communication

Technical Projects

Hardware & Digital Design...

QuantumID: Deep Spectral Fingerprinting Neural Network: Sep 2025–Jun 2026
Role: Lead Developer & Researcher (Final Year Thesis) | **Stack:** Python 3.10, PyTorch, NumPy, SciPy, Pandas, scikit-learn
Built an Optical Physical Unclonable Function (OPUF) authentication system from excitation-emission matrix (EEM) fluorescence spectra using a custom convolutional autoencoder. Designed a physics-aware preprocessing pipeline with universal regridding, hybrid normalization, and 50x physics-based augmentation for low-data regimes. Implemented a two-stage curriculum (reconstruction then contrastive separation) to produce a 1536-D latent fingerprint and a 1536-bit hash with high entropy and zero collisions across samples. Achieved 0.966 reconstruction

fidelity, strong latent separation, and sub-50ms inference for real-time authentication.

TSMC 65nm Real-Time Clock Design: Ring Oscillator IC Fabrication Flow: Sep 2023–Jun 2024
Role: Team Lead (6-member team) | **Tools:** S-Edit, T-Spice, L-Edit, Calibre DRC/LVS
Led complete integrated circuit design from RTL to GDSII tape-out for TSMC 65nm process node. Designed and implemented Ring Oscillator circuit for real-time clock chip. Performed extensive SPICE simulations to verify oscillation frequency stability and timing constraints. Conducted full physical verification including Design Rule Checking and Layout vs. Schematic validation. Successfully submitted GDSII files for fabrication with zero DRC violations. Achieved 15% area reduction through custom cell optimization and strategic floorplanning.

16-Stage FIR Notch Filter for Real-Time Audio on FPGA: Nov 2024–Dec 2024
Platform: Altera Cyclone V (DE1-SoC) | **Language:** SystemVerilog | **Tools:** Quartus Prime, ModelSim
Designed parametrized Finite Impulse Response digital filter with notch filtering capabilities for real-time stereo audio processing. Implemented 4-state FSM controller achieving 19-cycle latency (950ns at 50MHz) from ADC input to DAC output. Developed custom MATLAB scripts for optimal FIR coefficient generation and verification. Successfully processed dual-channel 48kHz audio with -40dB notch depth at configurable frequencies. Synthesized design utilized 2,847 logic elements (5% FPGA utilization).
 github.com/Bananz0/16-Stage-FIR-Notch-Filter

MIPSquare++: 5-Stage Pipelined MIPS Processor Simulator: Apr 2025–Jun 2025
Language: C++ (C++23) | **Tools:** CMake, CLion, Git
Developed comprehensive MIPS CPU simulator implementing realistic 5-stage pipeline architecture (Fetch, Decode, Execute, Memory, Write-Back) with full hazard detection and mitigation. Implemented custom MIPS assembly parser with label resolution supporting R-type (add, sub, and, or, slt, sll, srl, sra, jr), I-type (addi, lw, sw, beq, bne), and J-type (j, jal) instructions. Engineered intelligent data forwarding between EX/MEM and MEM/WB stages to minimize pipeline stalls. Developed load-use hazard detection with automatic pipeline stalling and branch hazard handling with pipeline flushing. Created comprehensive test suite including RAW hazard tests, control hazard tests, and showcase program (calculating squares 0-200 using odd number summation) optimized for minimal stalls. Achieved near 1 CPI with proper forwarding implementation. System featured separate instruction/data memory, 32-register MIPS register file, and configurable debug output for all pipeline stages.
 github.com/Bananz0/MIPSquare

WattsApp: Embedded Smart System Management Platform: Jan 2025–Mar 2025
MCU: AVR ATMega644p | **Stack:** Embedded C, InfluxDB, Grafana | **Protocols:** UART, I2C
Designed comprehensive embedded system management platform for real-time monitoring and control on AVR ATMega644p microcontroller. Developed bare-metal C firmware implementing sensor polling, data acquisition, and serial communication for telemetry streaming. Integrated InfluxDB time-series database for efficient historical data storage and Grafana dashboards for live system visualization and analytics. Implemented sensor interfaces for temperature (I2C), voltage/current monitoring (ADC), and GPIO control. Achieved sub-millisecond response times with interrupt-driven architecture and optimized data structures. System demonstrated in D2 IC Design coursework with successful chip testing and system integration demonstration.
 github.com/Bananz0/WattsApp

Software Development

GramSMC & Gram Control Panel: macOS Hardware Control Suite: 2026
Platform: macOS (Hackintosh) | **Tools:** DriverKit, macOS Kernel SDK, Objective-C, ACPI/ASL, C++
Developed a comprehensive hardware control suite for LG Gram 13Z990-R laptops on macOS, comprising a VirtualSMC kernel plugin and a native configuration utility. Engineered custom ACPI tables (SSDT) for hardware device mapping and implemented a DriverKit-based kernel extension using the macOS Kernel SDK for modern user-space driver architecture. Reverse-engineered LG embedded controller (EC) protocols to enable native keyboard backlight control, advanced battery management, and real-time thermal monitoring. Developed Gram Control Panel, an Objective-C based macOS application for hardware status visualization and fan profile management. Achieved native integration with the macOS System Management Controller (SMC) framework with zero kernel panics in 1,000+ hours of testing.
 github.com/Bananz0/GramSMC

WinStream: Windows to AirPlay Audio Bridge: Jun 2024–Present
Language: C#/.NET | **Technologies:** Virtual Audio Drivers, AirPlay Protocol
Creating Windows application enabling system-wide audio streaming to AirPlay devices (HomePod, Apple TV). Implemented virtual audio device driver for transparent audio capture and developed real-time audio encoding/transmission using AirPlay 2 protocol specifications. Achieved <50ms latency for lip-sync compatibility with video content. Overcame Windows audio subsystem limitations through kernel-mode driver development.
 github.com/Bananz0/WinStream

SmartSync Lighting: AI-Driven Smart Home Automation: Dec 2024–Present
Language: Python | **Libraries:** OpenCV, Spotify API, python-kasa
Engineered automated lighting system that synchronizes TP-Link smart bulbs with Spotify playback for immersive audiovisual experiences. Implemented computer vision algorithms using OpenCV for real-time album artwork analysis and dominant color extraction. Developed adaptive lighting schemes that adjust brightness and color temperature based on music genre classification and tempo detection. System processes and updates lighting in <200ms for seamless synchronization.
 github.com/Bananz0/SmartSync-Lighting

Somnus: Sleep Optimization Mobile Application: Jan 2025–Present
Platform: Android (Kotlin) | **APIs:** Health Connect, Google Fit, Samsung Health
Developing Android application that calculates optimal wake times using sleep cycle analysis and REM pattern detection algorithms. Integrated with Android Health Connect module for unified access to multiple health platforms. Implemented custom sleep stage classification model based on heart rate variability and movement data.
 github.com/Bananz0/Somnus

ControlCraft: Interactive Control Systems Analysis Toolbox: Nov 2024–Dec 2024
Platform: MATLAB GUI (App Designer) | **Features:** PID Tuning, Root Locus, Bode Plots
Built comprehensive educational tool for control systems analysis and design. Implemented interactive PID controller tuning with real-time step response visualization, automated stability analysis (Routh-Hurwitz, Nyquist), and transfer function manipulation tools. Includes frequency domain analysis with customizable Bode/Nyquist plots and time domain simulations. Successfully deployed in undergraduate control systems labs serving 60+ students.
 github.com/Bananz0/ControlCraft

PiBoard: Real-Time Collaborative Whiteboard: Apr 2024–May 2024
Framework: Qt (C++) | **Platform:** Raspberry Pi | **Protocol:** Custom Serial
Developed collaborative whiteboard application with custom serial communication protocol over GPIO. Implemented efficient data serialization for real-time drawing synchronization between multiple Raspberry Pi devices. Achieved <100ms update latency through optimized protocol design and threading architecture. System supports up to 4 concurrent users with automatic conflict resolution.
 github.com/Bananz0/PiBoard

Open Source & Personal Tools

Galaxy Book Enabler: 2024–Present
Language: PowerShell | **Downloads:** 8,300+ | **Stars:** 350+
Developed professional-grade Windows tool that spoofs PCs as Samsung Galaxy Books, unlocking the Samsung ecosystem including Quick Share, Multi Control, Samsung Notes, and 20+ exclusive applications. Implemented 21 authentic Galaxy Book hardware profiles with registry manipulation, automatic elevation via gsudo, and smart package management through WinGet. Features auto-update checker, System Support Engine integration, and seamless migration between versions.
 github.com/Bananz0/GalaxyBookEnabler

eGPU Auto-Enabler: 2024–Present
Language: PowerShell | **Technologies:** PnP Utilities, Power Management APIs
Created background service that automatically re-enables external GPUs after hot-plugging on Windows, eliminating manual Device Manager intervention. Implemented automatic PnP device monitoring with 2-second polling, custom power plan switching for optimal eGPU performance, and crash recovery with runtime state

preservation. Features Windows toast notifications for all events, 500KB rotating logs, and daily auto-update verification. Achieved 99.9% reliability with <50ms detection latency.

 github.com/Bananz0/eGPUae

MIPSquare: MIPS Assembly Simulator: 2024
Language: C++ | **Platform:** Cross-platform CLI
Built MIPS processor simulator for computer architecture coursework, implementing instruction decoding, register file management, and memory operations. Supports core MIPS instruction set including arithmetic, logical, branch, and memory access operations.

 github.com/Bananz0/MIPSquare

Sudoku Solver: Qt GUI Application: Mar 2024
Framework: Qt (C++) | **Algorithm:** Backtracking with constraint propagation
Developed interactive Sudoku puzzle solver with graphical user interface using Qt framework. Implemented efficient backtracking algorithm with constraint propagation for solving puzzles of varying difficulty. Features step-by-step visualization of solving process and puzzle generation capabilities.

 github.com/Bananz0/Sudoku-Solver

Infrastructure & Cybersecurity

Enterprise-Grade Home Network Infrastructure: Ongoing
Technologies: OPNsense, UniFi, Docker, Proxmox, HAProxy
Architected and deployed production-grade home network infrastructure including:

- **Network Security:** OPNsense firewall with Zenarmor IDS/IPS performing deep packet inspection; integrated Tailscale mesh VPN for zero-trust remote access; AdGuard DNS for network-wide ad/malware blocking
- **Containerized Services:** Docker Compose orchestration hosting 15+ services (Plex, Jellyfin, Nextcloud, Home Assistant, Sonarr, Radarr, Overseerr); HAProxy reverse proxy with SSL/TLS termination and load balancing across multiple backend servers
- **Virtualization:** Proxmox hypervisor managing 5 VMs for service isolation and resource optimization; implemented automated backup strategies with 3-2-1 rule compliance
- **Monitoring:** Prometheus + Grafana stack for real-time infrastructure monitoring; Uptime Kuma for service availability tracking

Achieved 99.8% uptime over 12-month period with zero security incidents. Infrastructure serves 8 concurrent users with average response times <50ms.

Hackintosh Systems Engineering: 2023–Present
Successfully built and maintained 3 production Hackintosh systems (laptops and desktops) demonstrating deep understanding of UEFI/BIOS architecture, kernel extensions (kexts), and macOS bootloader configuration. Created custom OpenCore EFI configurations ensuring hardware compatibility (WiFi, Bluetooth, audio, GPU acceleration). Published detailed build guides and EFI packages for HP EliteBook 440 x360 G1 benefiting community members.

 github.com/Bananz0/440-x360-G1-Hackintosh

Technical Skills

Programming & Hardware Description Languages
Proficient: SystemVerilog, C/C++, Python, JavaScript/Node.js
Competent: C#, MATLAB, Kotlin, PowerShell

Hardware Design & Embedded Systems
IC Design: TSMC 65nm Process, Cadence S-Edit/L-Edit/T-Spice, Mentor Calibre (DRC/LVS), GDSII Tape-out
FPGA/Digital: Altera Quartus Prime, Xilinx Vivado, ModelSim, SystemVerilog, VHDL
PCB Design: KiCad, Autodesk EAGLE, Altium Designer (basic)
Simulation: LTSpice, NI Multisim, MATLAB Simulink/Simscape
Platforms: Arduino (AVR/ARM), ESP32, Raspberry Pi, STM32 (basic)

Software Development..
Web Technologies: React.js, Express.js, RESTful APIs, WebSocket

Mobile: Android (Kotlin), Health Connect API

Databases: PostgreSQL, MongoDB, SQLite

Version Control: Git, GitHub, GitLab CI/CD

Cybersecurity & Networking..
Network Security: OPNsense/pfSense Firewall Configuration, IDS/IPS (Suricata, Zenarmor), VPN (Tailscale, WireGuard, OpenVPN)

Infrastructure: UniFi Network Management, HAProxy (Load Balancing/Reverse Proxy), SSL/TLS Certificate Management, VLAN Segmentation

Protocols: TCP/IP Stack, MQTT, Modbus RTU/TCP, SPI/I2C/UART, AirPlay

DevOps & Infrastructure...
Containerization: Docker, Docker Compose, Portainer

Virtualization: Proxmox VE, VirtualBox, VMware

Linux Admin: Ubuntu Server, Debian, Bash scripting, systemd, iptables

Monitoring: Prometheus, Grafana, Uptime Kuma

Tools & Software..
IDEs: VS Code, CLion, Android Studio, Quartus, Vivado

CAD/Modeling: Fusion 360, KiCad

Scientific: MATLAB (Control Systems Toolbox, Signal Processing, Simulink), Jupyter Notebook, NumPy/SciPy

Professional Memberships

2024–Present: Member, Institute of Electrical and Electronics Engineers (IEEE)

2024–Present: Member, Information Systems Audit and Control Association (ISACA)

2024–2026: Associate Member, Royal Aeronautical Society (AMRAeS)

Achievements & Activities

2025: Attended ISACA Winchester Chapter technical workshop on cybersecurity frameworks

2024–2026: Active open-source contributor and maintainer (public + private repositories; selected public contributions include endlessh-go, Nearby-Sharing-Windows, and AudioPlaybackConnector)

2024: Represented university at Engineering Society technical demonstrations

Additional Information

Languages: English (Native), Swahili (Native), Spanish (Beginner - A1)

Interests: Amateur radio (studying for Foundation License), IoT security research, HomeKit/Matter protocol development

Right to Work: UK Student Visa (valid until 2026), eligible for Graduate Route visa