Abdelkerim EL BANI

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Education

National Engineering School of Tunis (ENIT) Tunisia

Master's in Information System Techniques, Specialization: SST (M2) *Sep. 2025 – Present*

- **Relevant Coursework**: ML/DL, SoC Design, Speech Processing, Advanced Image Processing, Business Intelligence

National Engineering School of Tunis - Valedictorian (ENIT) Tunisia

National Engineering Diploma in Electrical Engineering *Sep. 2023 – Present*

- **Relevant Coursework**: Embedded Systems/Linux, IoT, VLSI/RISC-V, AI (TinyML/Edge AI), FreeRTOS

National Entrance Examination for Engineering Schools (IPEIM) Tunisia

Diploma of Preparatory Classes Math - Physics *Sep. 2021 – June 2023*

- **Relevant Coursework**: Algebra, Analysis, Probability and Statistics, Physics and Engineering Sciences, Python

Experience

ACTIA Engineering Services Tunisia

Electrical Engineering Intern *June 2025 – Aug. 2025*

- Executed sensorless Field Oriented Control (FOC) for brushless motors on an STM32G4 microcontroller using the P-NUCLEO-IHM03 pack.
- Conducted reverse engineering of STMicroelectronics motor communication protocols by intercepting virtual serial ports and systematically analyzing frames to decode packet structure, handshake sequences, and CRC mechanisms.
- Built a Qt SDK with a C parser achieving >99% compatibility with ST Motor Pilot, enabling real-time control and monitoring of the motor system.

WeWire Sarl Tunisia

Electrical Engineering Intern *July 2024 – Aug. 2024*

- Engineered and launched an automated IoT-based inventory management solution using ESP32.
- Applied Lean Manufacturing principles to optimize production flows.
- Collaborated with multidisciplinary teams to devise strategies for improving equipment efficiency.

Projects

Embedded Multitasking Platform (FreeRTOS, MQTT, SCADA) Sep. 2025 - Nov. 2025

- Architected and implemented a complete real-time system on STM32 with FreeRTOS, integrating multitasking management, SCADA interface on an external screen, USB keyboard via OTG, and sensor supervision.
- Managed network communication via MQTT, real-time data collection and processing, and microcontroller temperature supervision with automatic cooling control.

Embedded Object Classification System (TinyML, Computer Vision, SCCB) Sep. 2025 - Nov. 2025

- Constructed a complete embedded vision chain: image acquisition via OV7670 camera, preprocessing, and serial transfer via ESP32 to a NUCLEO-G431RB.
- Trained and quantized a CNN model under Linux, converted it to TFLite INT8 format, and integrated it on the microcontroller for local inference achieving ~10 FPS with 92.1% classification accuracy on test data.
- Assembled hardware and software for a TinyML system capable of continuous real-time object classification during testing, using <90 KB RAM and <200 KB flash on the NUCLEO-G431RB.

Real-Time Monitoring IoT Platform (Electron, Node.js, MQTT, SQL) Feb. 2025 - June 2025

- Built an Electron desktop application with MQTT subscription for live sensor data streaming and visualization, featuring hybrid storage (local database + cloud) and automatic daily PDF report generation with trend analysis and cost estimation.
- Designed a multi-channel alert system (desktop interface, email, timestamped logs) and demonstrated <1% packet loss with no data corruption during a 48-hour continuous test run, validating system stability.
- Packaged the solution into a standalone .exe installer integrating all dependencies, reducing deployment time by up to 70%.

AI-Powered Smart Myoelectric Prosthesis (TF Lite, CNN, Edge Computing) Nov. 2024 – May 2025

- Engineered a smart glove equipped with biometric sensors to capture limb movements.
- Created and trained a deep learning classification model using TensorFlow that achieved 83.14% classification accuracy.
- Integrated the model on a 3D-printed prosthesis for real-time, non-invasive control.
- Established a data pipeline to collect, clean, and annotate data for continuous model improvement.

Technical Skills

Hardware Design: Circuit Design, PCB Design and Fabrication (Eagle, Altium Designer)
Embedded Systems: Embedded Linux, FreeRTOS, Cross-compilation (via BeagleBone Black)
Embedded Platforms: Jetson Nano, Raspberry Pi, BeagleBone Black, FPGA Zybo (Vivado), STM32 (CubeIDE), ESP32
Programming Languages: Python, C/C++, VHDL, RUST
Simulation Tools: MATLAB, Labview, PSpice, PSIM, ModelSim, Keil v5 (STM32 emulation/debugging)
AI Development: TinyML (TFLite Micro), CNN, Edge AI, Computer Vision (YOLOv8)
IoT Development: MQTT (Mosquitto), InfluxDB, Grafana, Willio, SQLite
Data Tools: Pandas, Sklearn, NumPy, Matplotlib
Languages: German (Native), English (C2), French (C1), Arabic (Native)