SALAH-ELDIN HASSEN

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EDUCATION

- **Cairo University Faculty of Engineering, Department of Electronics and Electrical Communication Engineering (CUFE EECE).**

WORK EXPERIENCE

- **Robotics & Embedded Instructor | Beta Academy | Seasonal | Jan 2023 - Jan 2025.**
  - Promoted from Technical Support to Lead Instructor for Arduino and AVR embedded systems, instructing 600+ students in programming and hardware integration with consistently positive feedback.
- **Coding AI Trainer | Outlier | Freelancing | Sep 2024 - Dec 2024.**
  - Trained and optimized AI models for coding tasks through iterative evaluation, scenario-based testing, and targeted training frameworks to enhance code generation accuracy and algorithmic proficiency.

SKILLS

- **Software:** C / C++ - OOP - MATLAB - Assembly - Rust - Data Structures - Algorithms - Python - Automation - Scripting - Linux - Fedora - Kali Nethunter - AI tools - Qt - Git & Git-Hub - Latex.
- **Digital:** HDL languages (VHDL, Verilog, System Verilog) - TCL - FPGA Xilnix - Linting.
- **Embedded:** Atmega16/32 (AVR) - PIC18F2XK20/4XK20 (PIC) - STM32 - ARM Cortex-M - Embedded C - FreeRTOS - I2C - USART - SPI - SOMEIP.
- **Web:** HTML5 - CSS3 - JavaScript - Bootstrap - jQuery - Laravel - SQL.
- **Tools:** Visual Studio - Eclipse - Cube IDE - MPLAB Code Configurator - MATLAB - Proteus - Cadence - Multisim - Questa/Modelsim - Vivado - Arduino IDE - QT Creator - DataGrip - Altium.

PROJECTS

- **FreeRTOS-Based Dual Microcontroller Door Security System**
  - Developed a door security system using two microcontrollers with FreeRTOS for efficient task management, Implemented password authentication, I2C-based EEPROM storage, and automated door mechanisms to enhance access control. Integrated PIR sensors for motion detection and an H-bridge for motor control.
  - **Key Elements:** ATMega32, I2C, USART, EEPROM, FreeRTOS
- **Advanced Digital Multimeter on PCB**
  - Developed a digital multimeter capable of measuring voltage (-200V to 200V), current (0.5mA to 2A), and resistance (0Ω to 5MΩ). Designed the circuit from scratch and implemented it on a custom PCB. Integrated an LCD and keypad for user input, with ADC, relays, MUX, and DEMUX for signal processing.
  - **Key Elements:** ATMega32, PCB, GPIO, LCD, Keypad, ADC, Relays, MUX, DEMUX.
- **I2C-Integrated Control Unit**
  - Designed a control unit to monitor temperature and control a motor using multiple I2C devices, including a temperature sensor, RTC, external EEPROM, and a slave MCU. Developed firmware using MCC for seamless I2C communication.
  - **Key Elements:** PIC18F46K20, MCC, I2C, USART, RTC, EEPROM.
- **Concurrent Rust TCP Server**
  - Developed a multithreaded TCP server in Rust, transitioning from a buggy single-threaded implementation. Improved client handling using Protocol Buffers for structured communication. Optimized the test suite by resolving port conflicts through port isolation and serial execution strategies.
  - **Key Elements:** Rust, Multithreading
- **Advanced Tic Tac Toe Game**
  - Developed a C++ Tic Tac Toe game featuring user authentication, personalized game history, and AI-driven gameplay using the minimax algorithm. Implemented an interactive GUI with Qt, secure user management with hashing, and performance optimizations. Automated testing was conducted using Qt Test on Github Actions.

• **Key Elements:** C++, Minimax Algorithm, Secure Hashing, Qt, Qt Test, SQLite, Git, GitHub Actions.

- **Advanced Image Editor with Qt and OpenCV**

  • Built a C++ image editor using Qt and OpenCV, supporting cropping, resizing, and various filters (blur, grayscale, sharpen). Designed a dark mode UI with drag-and-drop image loading and real-time editing capabilities.

  • **Key Elements:** C++, OpenCV, Qt.

- **SPI Slave Interface**

  • Designed a modular and hierarchical architecture for the SPI Slave Interface project, incorporating key components such as the SPI Slave Interface and RAM modules. Developed self-checking testbenches to validate functionality and performance of these modules, ensuring efficient and reliable operation.

  • **Key Elements:** Vivado, Questasim, Verilog, SPI, Single-Port RAM, Constraints, Linting.

- **Spartan-6 DSP48A1**

  • Developed a DSP48A1 block, a crucial component in digital signal processing. Designed in Verilog and tested using C++ (Created golden modle) and Verilog test benches. The project includes simulation results, lint reports, and automation scripts for verification.

  • **Key Elements:** Verilog, DSP48A1, C++ Simulation, Test Benches, Linting.

- **Laravel Workshops System**

  • Developed a Laravel-based system for managing workshop sessions, enabling creation, scheduling, participant registration, and attendance tracking. Implemented a responsive UI with Bootstrap and ensured data integrity with MySQL.

  • **Key Elements:** Laravel, PHP, MySQL, Bootstrap, Git.

OTHER PROJECTS

- Multi-CV Generator Script - Automated Multi-CV generation using Python for ATS-friendly resume formatting.
- Simulation & Linting Scripts - Developed Python and batch scripts for running ModelSim simulations, waveform viewing (GTKWave), and linting Verilog files using Qverify.
- Maze-Solving Line-Follower Robot Car - Arduino-based pathfinding robot.
- SFML Chess Game - C++ chess game with an interactive GUI.

COURSES

- **Advanced Embedded Diploma | Eng: Ahmed Abdel-Gafar | Dec 2024 - Current.**
  - Comprehensive training on ARM Cortex-M4 architecture, debugging, and memory systems.
  - Embedded systems development covering compilation process, linker script, and startup code.
  - Device driver development for GPIO, RCC, SysTick Timer, Flash Memory Interface, and NVIC.
  - Bootloader design, implementation, and testing for embedded applications.
  - Automotive communication protocols including LIN and CAN.
  - Introduction to AUTOSAR fundamentals, layered architecture, and modular programming.
  - Compliance with MISRA C standards for secure and reliable embedded development.
- **Embedded PIC Diploma | Eng: Ahmed Abdel-Gafar | Jul 2024 - Sep 2024.**
  - Fundamentals of embedded systems, C programming, and embedded development tools.
  - PIC microcontroller interfacing with full driver implementation using Embedded C.
  - Communication protocols including USART, SPI, and I2C.
- **Embedded AVR Diploma | Eng: Mohammed Tarek | Jun 2024 - Oct 2024.**
  - Fundamentals of embedded systems, C programming, and real-time operating systems (RTOS).
  - Data structures including linked lists, stacks, and queues, along with software engineering principles.
  - AVR microcontroller interfacing with full driver implementation using Embedded C.
  - Hands-on hardware labs for practical embedded systems development.
- **SOME/IP Workshop | BULLET - Eng/Hazem | OCT 2024 - OCT 2024.**
  - Hands-on experience with the SOME/IP protocol through a practical workshop.
  - Implemented sample client-server communication for networked embedded systems.

  • Explored service-oriented middleware for automotive and IoT applications.

- **Linux Fundamentals | IEEE ASU | Aug 2024 - Sep 2024.**
  • Learned Linux file management, shell scripting, and user permissions.
  • Gained skills in process control, package handling, and filesystem management.
  • Developed expertise in Linux networking, SSH, and web server setup.
- **Digital Design Diploma | Eng: Kareem Waseem | Jan 2025 - Mar 2025.**
  • Gained a solid foundation in Digital and RTL Design using Verilog for synthesis and simulation.
  • Worked with FPGA design flow, including Vivado, IP catalog, and FPGA-based prototyping challenges.
  • Learned Static Timing Analysis (STA), clock domain crossing techniques, and low-power design methodologies.
  • Performed code linting and design rule checks using Questa Lint for quality verification.
- **Digital Verification Course | IEEE CUFE | Mar 2025 - Current.**
  • Gained expertise in simulation-based verification using UVM, UVM structures, sequences, and configuration.
  • Proficient in QuestaSim for simulation, verification planning, functional coverage, and SystemVerilog assertions.
  • Studying formal verification techniques, clock domain crossing analysis, and debugging FPGA-based designs.

- **Competitions & Activities:** First place in Robotics Competition (2022), ECPC Contestant (2022, 2023), NASA Hackathon participant.