

# MARWAN ZEIN

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## Education

Faculty of Computers and Data Science, Alexandria University

Expected Graduation: May 2027

Bachelor of Computer Science

Alexandria, Egypt

- **Concentrations:** Competitive Programming, Software Engineering, Cybersecurity
- **Related Coursework:** Data Structures & Algorithms Design & Computing in (Java, Python, R ) &, Data Science, Combinatorics, Machine Learning, Artificial Intelligence, Object-Oriented Programming, Statistics & Applications & mathematics (linear algebra, advanced calculus and probability )

## Skills

**Programming Languages:** C++ (Qt6, wxWidgets, platformio), Java , Python, JavaScript (Node.js), HTML, CSS, kotlin

**Frameworks & Libraries:** NestJS, ExpressJs, Flask, Flutter, Swing, MVC, OOD, OOP

**Databases:** Microsoft SQL Server, PostgreSQL

**Tools & Platforms:** Docker, Git/GitHub, AWS (EC2, S3, IAM, VPC), Azure, Microservices, Linux Administration

**Security:** OWASP Top 10, CTF Player

**Software Development:** Agile & Plan-driven Processes, System Design, Software Methodology, Software Documentation

**Other:** Competitive Programming (ECPC finalist), Algorithms Analysis, Data Structures

## Projects

**VisionGate – Smart Parking System** | *NestJS, TypeORM, Docker, ESP32 (C++), MQTT, Flask, Azure, PostgreSQL* **May 2025**

- Developed an end-to-end **IoT & AI smart parking solution** integrating computer vision, real-time IoT devices, and scalable backend services.
- **Backend:** Designed NestJS microservices with JWT authentication, CRUD car management, ESP communication, AI model integration, MQTT messaging, and subscription plan management. Deployed on **Azure PostgreSQL**, containerized with **Docker**, and published to Docker Hub.
- **IoT:** Engineered modular ESP32 firmware (**C++/PlatformIO**) with OOP principles, Wi-Fi configuration, TLS-secured MQTT communication, and hardware integration (servo, buzzer, LCD, LEDs, IR/LDR sensors). Achieved **100% event-driven flow reliability**.
- **System Architecture:** Designed a **service-oriented architecture (SOA)** using lightweight microservices (NestJS backend, Flask AI model, Flutter mobile app, ESP IoT), ensuring **scalability, modularity, and maintainability**.
- **Teamwork:** Collaborated with a 4-member team to deliver a **production-ready prototype** demonstrating backend engineering, embedded systems, and cloud deployment.
- **GitHub Repository**

**File Sharing Web Application** | *Node.js, AWS (EC2, S3, IAM, VPC), JavaScript*

**March 2025**

- Designed and deployed a **secure file-sharing web application** with REST APIs supporting file upload and download.
- Leveraged **AWS EC2** for backend hosting, **S3** for object storage, **IAM** for access control, and **VPC** for network isolation.
- Implemented **security best practices** (IAM policies, least-privilege access, credential management) while optimizing AWS Free Tier resources for cost efficiency.
- **Frontend:** Deployed a static UI on S3 and integrated it with backend APIs for a seamless user experience.
- **GitHub Repository**

**Rusty-x86\_64 Operating System Kernel** | *Rust, x86-64, QEMU, Memory Management, Linux, Git*

**Jan 2026**

- Designed and implemented a **64-bit operating system kernel in Rust** targeting the x86\_64 architecture with a modular, layered system design.
- Built core subsystems including **memory management, interrupt handling (GDT/IDT), and custom allocators** with an emphasis on safety and performance.
- Applied **backend architecture principles** such as separation of concerns, reliability, and scalability in a bare-metal environment.
- Leveraged Rust's **ownership and concurrency model** to enforce memory safety and prevent low-level race conditions.
- Developed and tested the kernel using **QEMU virtualization** and Git-based workflows.
- **GitHub Repository**

## Achievements

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### Egyptian Collegiate Programming Contest (ECPC)

Summer 2024

- Qualified for the **ECPC finals** on first participation.
- Placed **5th overall in qualifiers** and **2nd within faculty** among dozens of teams.
- Strengthened competitive programming, problem-solving, and teamwork under time constraints.
- Certification

## Civil Work and Activities

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### ElCode-FCDS

August 2023

*Coding Instructor & Content Creator*

- Conducted coding workshops and created educational content to simplify software engineering concepts.
- Mentored peers in programming and development, fostering a collaborative learning environment.

### ICPC-FCDS

November 2023

*Organizing Committee Representative*

- Organized and coordinated ICPC-FCDS events, ensuring smooth execution of contests and training sessions.

### TECHNE Summit

October 2024

*Attendee*

- Engaged with industry professionals and explored emerging trends in technology and software engineering.