Carlos Alfonso

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EDUCATION

University of Central Florida | Orlando, FL — Aug. 2022 – May 2026

TECHNICAL SKILLS

Programming Java – Python – C – C++ – VBA – C# **Other** Electrical Circuits – Real-Time Systems – Unity – Robotics

Experience RabbitMQ – Git – RESTful API – PostgreSQL – Piston – Colyseus – Docker – Pandas – Linux – Angular – Springboot – Fusion360 – Insomnia – PDF-JS – AI Tokenization – MySql – Enterprise Computing – Embedded Systems – Computer Networks – JWT – Flutter – ExpressJS

INTERNSHIP EXPERIENCE

Bank of New York | Lake Mary, FL — June 2025 – July 2025

SWE Intern

• Developed a full-stack web application in a **POM** team using **Angular** and **Spring Boot,** improving scalability and reliability in processing legal trade documents.

• Utilized **HashMaps** to efficiently store and classify legal document metadata, maintaining backend operations with **O(1)** average-time lookups and minimizing runtime overhead.

• Built and maintained a **CI/CD pipeline** to automate builds, testing, and deployment, achieving **90% validation accuracy** and reducing manual QA overhead.

• Integrated **MongoDB** to streamline the ingestion and organization of incoming legal documents within a document processing tool, improving data accessibility and query speed.

• Designed and integrated **RESTful APIs** using **Insomnia** to test and validate data flow between front-end and back-end systems.

• Connected the **Spring Boot backend** to internal **AI microservices**, relying on **service-oriented architecture** and real-time data processing.

National Renewable Energy Laboratory | Golden, CO — May 2023 – July 2023

SWE Intern

• Developed a **Python-based Energy Sector Analysis Tool**, leveraging **Pandas**, **NumPy**, and optimized **data structures** to efficiently analyze over **5 million+ rows** of real and simulated data.

• Connected **MySQL** databases directly to a Python-based analytics tool using **Pandas**, enabling automated import and processing of large-scale energy grid datasets.

• Conducted extensive **unit testing** and debugging to ensure computational accuracy and stability during large-scale simulations.

• Collaborated with researchers to integrate the tool into broader **energy modeling systems**.

• Designed and implemented a **binary tree architecture** to represent energy sector divisions (e.g., renewable vs. nonrenewable), enabling **O(log n)** query performance for hierarchical data analysis.

BuildBots Robotics Instructor/Developer | Weston, FL — 2011 – July 2023

• Built and maintained an **Umbraco-based website** to support robotics programs, including updates, scheduling, and parent/student access.

• Managed **customer-facing communication**, resolving issues regarding class schedules, registration, and account access.

PROJECTS

CodeCrack Web Application (Current)

• Led **backend development** using **Python** and **RESTful APIs** to enable efficient communication with a **PostgreSQL database**, ensuring secure and optimized data transactions.

• Implemented a **Colyseus** architecture to manage matchmaking and state synchronization between a **Django** backend and **PixiJS** frontend.

• Implemented **modular, object-oriented backend components**, improving system maintainability and enabling rapid feature expansion.

• Implemented secure environments using **Piston** to safely execute **Python** code, ensuring robust and reliable **backend** operations.

• Collaborated with front-end developers to integrate backend APIs seamlessly, improving **end-to-end latency** and overall **application scalability**.

• Applied **algorithmic optimizations** and performed **unit testing and debugging** to enhance backend **stability, efficiency, and fault tolerance** designed for high-load conditions.

National Renewable Energy Laboratory Hydrogen Business Case Prize Competition

• Headed the creation of a VBA-based tool to load CSV files into Excel, enabling comprehensive business case analysis for the Hydrogen Business Case Competition.

• Created and refined growth potential and payback period algorithms, integrating diverse datasets to ensure accurate and reliable outputs.

• Collaborated with a team of 5 students to win the competition, securing over $50,000 in prize money by demonstrating innovation and technical proficiency.

Organizations

Society of Hispanic Professional Engineers

• Developer of a rocket payload team tasked with creating and designing feasible **CONOPs** to run experiments.