

# Rafael Castro

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## EDUCATION

### **Bachelors of Science**

June. 2026

*Oregon State University, Corvallis OR*

Bachelors of Science with a Major in Biological Sciences and a Minor in Computer Science

## EXPERIENCE

### **Open Source Lab Software Engineer- College of Engineering**

Feb. 2023 - Feb. 2024

*Oregon State University, Corvallis, Oregon*

Co-led development of an eDNA water sampler, optimizing membrane filters (0.45µm → 2–5µm) to reduce cross-contamination 45% and increase throughput 60%, meeting strict sterility, volume, and energy requirements.

Enhanced embedded system performance through C++ firmware, UI integration, and real-time sensor data acquisition for reliable operation in field conditions.

Optimized sensor performance using oscilloscopes, improving data precision by 30% and cutting troubleshooting time by 40%.

### **AI Applications Engineer – Division of Research & Innovation**

Sept. 2025 - Present

*Oregon State University, Corvallis, Oregon*

Developed AMIE, a multi-agent AI system on Microsoft Azure, creating agents with Azure AI Foundry and orchestrating Azure Functions + Durable Functions with API Management for automated ingestion and retrieval of research manuscripts in Blob Storage, using Agile sprints for iterative feature improvement.

Built RAG pipelines leveraging vector embeddings and semantic search to ground agent reasoning on scholarly archives, patents, and manuscripts for novelty detection, with weekly sprint-based feature releases and code reviews.

Designed multi-agent orchestration (MAO) enabling agents to collaborate in real-time across distributed resources, achieving sub-second retrieval latency.)

## PROJECTS

### **EcoBeavs - Vue 3 / Vite / Tailwind CSS / AWS Lambda / Leaflet / AWS [EcoBeavs](#)**

June 2025 - Oct. 2025

Built a single-page sustainability dashboard for Oregon State University & Corvallis that aggregates six data sources (weather, carbon intensity, air quality, watershed flow, transit, renewables) into one responsive UI.

Secured all third-party APIs behind a Node 22 AWS Lambda proxy, eliminating exposed keys and slicing external request count by 60% through 60-second-in-function caching.

### **Sealie IoT – Python/ Serial/ GPT4All/ DHT/IMU Sensors**

Mar. 2025 - Present

Developed a real-time telemetry platform for drones and robots, incorporating modular UI and live data visualization for instant sensor diagnostics.

Implemented data logging and CSV export functionality, enabling real-time storage and easy data analysis for sensor diagnostics, while integrating customizable UI themes to enhance user experience and system flexibility.

Integrated GPT4All assistant to generate offline statistical summaries and automate exploratory data analysis (EDA), trimming data interpretation time by 30%

## **Skynet - JavaScript/HTML/CSS • React • Node.js • Express • FastAPI, OpenSkyAPI/OpenAI | [Skynet](#)**

Built a real-time flight tracking web application displaying metrics such as altitude, speed, coordinates, and heading, providing live situational awareness for users.

Developed a polyglot architecture: React frontend, Node.js/Express proxy, Python ML services, integrating OpenSky API for flight data and OpenAI for context-aware chat insights.

## **SportsOnCourts - TypeScript//Tailwind CSS/ Python/ FastAPI/ React | [SportsOnCourts](#)**

Developed SportsOnCourts, a React + Tailwind + FastAPI platform that tracks NBA player activity, predicts injury risk, and visualizes league-wide trends in real time.

Implemented multi-factor injury prediction engine combining environmental, workload, biomechanical, and historical injury data; exposed via RESTful endpoints (/predict\_injury, /analytics/league-trends) for integration with dashboards and client apps.

## **Scholarpy API – Python**

Aug. 2025 - Present

Developed pluggable scrapers, async HTTP clients, and in-memory caching for high-throughput querying; persisted structured metadata in MongoDB, with optional Azure Blob Storage for large binaries.

Delivered RESTful endpoints with auto-generated OpenAPI docs, enabling researchers, data scientists, and ed-tech teams to programmatically query literature and patents for dashboards, ML pipelines, and automated alerts.

## **SKILLS**

**Programming & Scripting:** Python, C++, C, C#, R, JavaScript (ES6+), HTML, CSS

**Frameworks & Libraries:** .NET, React.js, Node.js, Express, Pandas, NumPy, Matplotlib, Seaborn, Kivy, Tkbootstrap, Unity, Unreal Engine 5

**AI & Machine Learning:** Generative AI Agents, Prompt Engineering, LangChain, Retrieval-Augmented Generation (RAG), Azure OpenAI, Vertex AI, Azure AI Studio, Azure, AWS Bedrock

**Software Development Methodologies:** Agile, Scrum, Version Control

**Cloud & DevOps:** Microsoft Azure, Google Cloud Platform, Amazon Web Services, Docker, Git/GitHub, Linux/Ubuntu, CI/CD

**Hardware & Embedded Systems:** ESP32, STM32, Arduino (ATMega328), I2C/SPI/UART, PCB Design (EasyEDA/Altium), Signal Processing, Oscilloscope

**Networking & IoT:** MQTT, REST APIs, NRF24L01, Device-to-Device Communication

**Security:** OAuth2, SHA-256 Hashing, AES/DES, RSA, HIPAA Compliance, Digital Signatures

**Relevant Coursework:** Cryptography (CS 427), Data Structures (CS 261), Software Engineering I (CS 361), Web Development (CS 290), Digital Logic Design (ECE 271)

## **LEADERSHIP**

### **Secretary- M.A.P.S.**

Oct. 2023 - Jun. 2024

*Minority Association of Pre-Medical Students, Corvallis, Oregon*

Led a cross-disciplinary team of 10+ members, setting clear goals and resource allocation strategies, resulting in a 30% increase in project efficiency

Boosted membership engagement by 40% by creating and promoting 5+ targeted events for pre-medical students, enhancing career development opportunities.

Organized and facilitated 8 educational workshops for over 200 local youth, introducing to health and science concepts through interactive activities.

## **Project Leader - Electrical Team**

Sep. 2024 - Present

*OSU DAM Robotics, Corvallis, Oregon*

Collaborated with a team of 8+ engineers from multiple disciplines to design and deliver a cost-effective ROV, achieving performance specifications within a \$500 budget.

Led the design of a power distribution system for an ROV, stepping down 48V to 12V and 5V, ensuring stable power supply for 6 sensors, 4 motors, and 2 cameras, improving system efficiency by 25%.