JOSE CASTILLO

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EDUCATION

University of California, San Diego – Jacobs School of Engineering
Bachelor of Science in Bioengineering: Biosystems **(Sept 2022 – Present)**

- Overall GPA: 3.4 | Major GPA: 3.9
- Provost Honors (8 consecutive quarters)
- Relevant Coursework: *Analog Design, Circuits and Systems, Linear Systems Fundamentals, Biomedical Signals & Systems, BioSystems Engineering Lab, Modeling & Computation in Bioengineering, Numerical Analysis–Computational Engineering, Intro to Autonomous Vehicles*

Skills

Programming Languages: Python, C++, MATLAB
Software Environments: SOLIDWORKS, ROS, ROS2, SLAM, Docker, AutoCAD, OpenCV, OpenSIM, Scikit-Learn, TensorFlow, PyTorch, Arduino IDE, PSTrace, LabVIEW, Altium Designer, PSpice,
Hardware: Circuit Design, Analog Signal Processing, Jetson Nano, Arduino Mega 2560, Embedded Systems, Microcontroller Programming, PID, PCB Design, Digital Signal Processing, Instrumentation Amplifiers (AD622, LM741, AD8232), 3D Printing, Microfabrication, Potentiostat use, Sputtering (Denton Discovery 365),

Work Experience

Teaching Assistant – Intro to Autonomous Vehicles (ECE/MAE148), UC San Diego **(Jul 2025 – Present)**

- Support 50+ students in ROS/ROS2, computer vision, ML, and embedded systems for autonomous driving.
- Provide ~20 hrs/week of labs, debugging, and project support, improving completion rates and technical confidence.
- Collaborated closely with faculty to refine course documentation and lectures, improving curriculum effectiveness and student engagement.

Research Experience

Research Assistant – NanoBioElectric Lab (NBE), UC San Diego **(May 2025 – Present)**

- Performed microfabrication and iterative refinement of microneedle arrays used in continuous monitoring of biomarkers including glucose, lactate, cortisol, etc.
- Integrate electrochemical sensors with biocompatible substrates, focusing on reliable skin sensor interfaces and low noise signal acquisition.
- Support experiment planning, data collection and analysis with PhD Mentor, Omeed Djassemi and Principal Investigator, Dr. Joseph Wang, contributing to translational medical device development.

Publication – NBE Lab, UC San Diego **(May 2025 – Nov 2025)**

- Wang, Joseph; Djassemi, Omeed ; Chang, An-Yi; McGuire, W. Cameron; Mitchell, Emily; Saha, Tamoghna; Fernandes, Timothy; Yang, Jenny; Miller, Michael; Wurster, Cannon; Morales-Fermin, Sofia; McGregor, Ian; Castillo-Valdovinos, Jose; Malhotra, Atul "Clinical Evaluation of Microneedle Biosensors for Continuous Lactate Monitoring in Critically Ill Patients", ACS Sensors, manuscript under review, 2025.
- Listed as co-author for preparing microneedle devices used in experiments and creating the supplementary figure/video documenting the fabrication workflow.

ECG and EPG Signal Analysis for Biomedical Pattern Recognition – NBE Lab, UC San Diego **(Jun 2025 – Sept 2025)**

- Designed an integrated system using Arduino Mega, AD8232, and MAX30101 instrumentation amplifiers for simultaneous electrocardiogram (ECG) and electropalatography (EPG) recording.
- Implemented advanced digital signal processing techniques (Butterworth filtering, Savitzky-Golay smoothing, baseline correction) in MATLAB to enhance signal integrity and facilitate precise pattern analysis.
- Conducted time-domain synchronization analysis, successfully identifying meaningful correlations between cardiac activity (ECG) and articulatory movements (EPG), demonstrating potential diagnostic markers.

"LegoEEG" Modular EEG Headset – Capstone Project, UC San Diego **(Jun 2025 – Present)**

- Co-designing a modular EEG headset with interchangeable hydrogel-based electrodes and custom low-noise amplifier and main control PCBs.
- Lead the electrical subsystem and coordinate with the biomaterials subgroup to develop PEDOT: PSS–PVA hydrogel electrodes and matching amplifier interface PCB.
- Characterizing electrode–skin impedance and EEG signal quality to iteratively optimize hydrogel formulation, front-end circuitry, and board layout.

Relevant Projects

Enhancing Breast Cancer Diagnostics: A Machine Learning Approach, UC San Diego **(Sept 2024 – Dec 2024)**

- Trained Logistic Regression and K-Means models achieving 96.49% accuracy for benign vs malignant tumor classification
- Used Principal Component Analysis (PCA) for dimensionality reduction improve feature interpretability and model efficiency

Autonomous Vehicle with Jetson Nano & Machine Learning, UC San Diego **(Jan 2025 – Mar 2025)**

- Designed and 3D-printed a fully autonomous scale vehicle and integrated sensors, Jetson Nano, and Arduino.
- Implemented OpenCV-based perception and ML-driven control for real-time navigation and obstacle avoidance.

Prosthetic Hand with EMG-Controlled Servo Motors, UC San Diego **(Jan 2025 – Mar 2025)**

- Built a 3D-printed prosthetic hand actuated by servo motors under EMG control.
- Designed analog signal-processing circuitry (DC offset, LM741, AD622, Lowpass/Highpass Filters) and Arduino firmware to map EMG features to grasp motions.

Extracurricular Activities

Biomedical Engineering Society, UC San Diego **(Sept 2023 – Present)**

- Project Team Committee member, designing hands-on device projects and leading twice-per-quarter technical workshops.
- Developed step-by-step project documentation so that students of all levels could follow circuits, coding, and build instructions independently.
- Supported the BMES mentorship program by advising underclassmen on coursework, research opportunities, and how to approach labs and faculty.

Executive Board – Phi Gamma Delta, UC San Diego **(Dec 2024 – Dec 2025)**

- Lead communication between chapter members, alumni, and the national organization; implemented structured record-keeping to streamline operations.
- Organized alumni networking events that connected undergraduates with professionals, helping members secure internships and job opportunities.
- Helped plan community service events, including cleanups at the USS Midway in San Diego and a kayak-based trash cleanup in the San Diego Bay wetlands with the nonprofit Ocean Connectors.