

JOSE CASTILLO

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EDUCATION

University of California, San Diego – Jacobs School of Engineering	(Admitted, Fall 2026)
M.S. in Electrical Engineering	
University of California, San Diego – Jacobs School of Engineering	(Sept 2022 - Present)
B.S. in Bioengineering: Biosystems GPA: 3.4 Overall / 3.9 Major Provost Honors (8 consecutive quarters) Relevant Coursework: Analog Design, Circuits & Systems, Linear Systems Fundamentals, Biomedical Signals & Systems, BioSystems Engineering Lab, Modeling & Computation in Bioengineering, Numerical Analysis, Intro to Autonomous Vehicles	

Skills

Programming Languages: Python, C++, MATLAB
Software & Frameworks: ROS/ROS2, Docker, OpenCV, SLAM, TensorFlow, PyTorch, Scikit-Learn, OpenSIM, SOLIDWORKS, AutoCAD, Altium Designer, LabVIEW, PSTrace, PSpice, Arduino IDE
Hardware & Fabrication: Circuit & PCB Design, Analog/Digital Signal Processing, Embedded Systems, Microcontroller Programming (Arduino Mega 2560, Jetson Nano, RPI 5, ESPS3/C3), Instrumentation Amplifiers (AD622, LM741, AD8232, MAX30101), PID Control, Microfabrication, Sputtering (Denton Discovery 365), Potentiostat, 3D Printing
Biomedical & Electrochemical Techniques: Amperometry, Square Wave Voltammetry, Microneedle Array Fabrication, Hydrogel Synthesis (PEDOT: PSS-PVA), Electrode-Skin Impedance Characterization, Bluetooth Sensor Integration

Publications
Djassemi, O.; Chang, A.-Y.; McGuire, W. C.; Mitchell, E.; Saha, T.; Fernandes, T.; Yang, J.; Miller, M.; Wurster, C.; Morales-Fermin, S.; McGregor, I.; Castillo-Valdovinos, J.; Malhotra, A.; Wang, J. "Clinical Evaluation of Microneedle Biosensors for Continuous Lactate Monitoring in Critically Ill Patients." ACS Sensors 2026, 11 (2), 1413-1424. DOI: 10.1021/acssensors.5c03699
Contributed as co-author by fabricating microneedle array devices used in clinical experiments and producing the supplementary figure and fabrication workflow video documenting the full device preparation protocol.

Research Experience	
Research Assistant - NanoBioElectronic Lab (NBE), UC San Diego	(May 2025 - Present)
Principal Investigator: Dr. Joseph Wang PhD Mentor: Omeed Djassemi	
Perform microfabrication and iterative optimization of microneedle arrays for continuous monitoring of biomarkers including glucose, lactate, and cortisol.	
Integrate electrochemical sensors with biocompatible substrates, emphasizing reliable skin-sensor interfaces, and low-noise signal acquisition.	
Implement and debug square wave voltammetry and amperometric detection routines; integrate the NBE coinboard with Python Bluetooth files for wireless real-time tracking.	
Develop hydrogel electrode formulations and perform breadboard validation of dry electrode performance for the LegoEEG capstone project.	
Support experiment planning, data collection, and analysis in collaboration with the PI and PhD mentor, contributing to translational medical device development.	
ECG and PPG Signal Analysis for Biomedical Pattern Recognition - NBE Lab, UC San Diego	(Jun 2025 - Sept 2025)
Designed an integrated acquisition system using an Arduino Mega, AD8232, and MAX30101 instrumentation amplifiers for simultaneous ECG and PPG recording.	
Applied advanced DSP techniques (Butterworth filtering, Savitzky-Golay smoothing, baseline correction) in MATLAB to enhance signal quality and enable precise waveform analysis.	
Conducted time-domain synchronization analysis, identifying meaningful correlations between cardiac activity and peripheral perfusion signals with potential diagnostic value.	
"LegoEEG" Modular EEG Headset - Capstone Project, UC San Diego	(Jun 2025 - Present)
Co-designing a modular EEG headset featuring interchangeable PEDOT: PSS-PVA hydrogel electrodes and custom low-noise amplifier and control PCBs designed in Altium Designer.	
Lead the electrical subsystem; coordinating with the biomaterials subgroup to align electrode formulation with amplifier interface requirements.	
Characterizing electrode-skin impedance and EEG signal quality through iterative design cycles to optimize hydrogel composition, front-end circuitry, and board layout.	
Performing breadboard-level prototyping to validate dry electrode performance prior to PCB integration.	

Work Experience	
Teaching Assistant - Intro to Autonomous Vehicles (ECE/MAE148), UC San Diego	(Jul 2025 - Present)
Support 50+ students across two quarters in ROS/ROS2, computer vision, machine learning, and embedded systems for autonomous vehicle development.	
Deliver approximately 20 hours per week of hands-on lab instruction, technical debugging, and project support, improving student completion rates and technical confidence.	
Developed and maintained course documentation and step-by-step guides for the course website, enabling students to seamlessly follow hardware integration workflows.	
Collaborated closely with faculty to refine lectures and curriculum, incorporating new hardware integrations (Winter 2026, 60+ students under Dr. Jack Silberman).	

Relevant Projects	
Autonomous Vehicle with Jetson Nano & Machine Learning, UC San Diego	(Jan 2025 - Mar 2025)
Designed and 3D-printed a fully autonomous scale vehicle; integrated sensors and a Jetson Nano into a unified embedded system.	
Implemented OpenCV-based visual perception and ML-driven control algorithms for real-time navigation and obstacle avoidance in ROS2.	
Trained and evaluated models on collected datasets to optimize real-time decision-making and object recognition accuracy.	
Prosthetic Hand with EMG-Controlled Servo Motors, UC San Diego	(Jan 2025 - Mar 2025)
Designed and fabricated a 3D-printed prosthetic hand actuated by servo motors under real-time EMG control.	
Developed analog signal-processing circuitry (DC offset removal, LM741 op-amps, AD622 instrumentation amplifiers, low-pass/high-pass filters) and Arduino firmware to map EMG features to distinct grasp motions.	
Enhancing Breast Cancer Diagnostics: A Machine Learning Approach, UC San Diego	(Sept 2024 - Dec 2024)
Trained and evaluated Logistic Regression and K-Means clustering models in MATLAB, achieving 96.49% accuracy in benign vs. malignant tumor classification on a dataset of 569 patient samples.	
Applied Principal Component Analysis (PCA) for dimensionality reduction, improving feature interpretability and model efficiency.	

Extracurricular Activities	
Biomedical Engineering Society, UC San Diego	(Sept 2023 - Present)
Design hands-on device projects and lead twice-per-quarter technical workshops covering circuits, coding, and hardware builds.	
Produce step-by-step project documentation to ensure students of all skill levels can follow instructions independently.	
Support the BMES mentorship program by advising undergrads on coursework, research opportunities, and faculty engagement strategies.	
Executive Board - Phi Gamma Delta, UC San Diego	(Dec 2024 - Dec 2025)
Managed communication between chapter members, alumni, and the national organization; implemented structured record-keeping to streamline chapter operations.	
Organized alumni networking events that connected undergrads with industry professionals, directly facilitating internship and job placements.	
Co-led community service initiatives, including environmental cleanups at the USS Midway and a kayak-based litter removal event in San Diego Bay with nonprofit Ocean Connectors.	