Carlos Abarca

Antioch, CA
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Education

University of California, Santa Barbara **Aug. 2023 – Sept. 2025**
Bachelor of Science in Mechanical Engineering *Santa Barbara, CA*

Diablo Valley College **Aug. 2020 – Jun. 2023**
Pre-Engineering Coursework — Mechanical Engineering Transfer *Pleasant Hill, CA*

Relevant Coursework

- Mechanical Engineering Design
- Thermosciences I & II
- Fluid Mechanics
- Dynamics & Vibrations
- Mechatronics
- Machine Learning for Engineers
- Vehicle Dynamics
- Manufacturing & GD&T

Experience

True Digital Surgery — Mechanical Engineering Capstone **Aug. 2024 – Jun. 2025**
Mechanical Engineer, Team Member *Santa Barbara, CA*

- Collaborated with a 5-member team to resolve thermal issues in a surgical camera by relocating LEDs to the base and routing light through four fiber-optic bundles, improving reliability.
- Authored SOPs for inspection, verification, and thermal testing of PCB/LED assemblies on aluminum heat sinks; validated optical output across white, IR, UV, and fluorescence bands.
- Performed soldering, rework, and troubleshooting of prototype PCBs.
- Designed aluminum light-module housing and optical collimator in SolidWorks.
- Produced machinable GD&T drawings and collaborated with machinists to improve DFM, reduce cost, and integrate off-the-shelf components.
- Led rapid prototyping of 3D-printed FFF models for tolerance checks, transitioning to CNC-machined 6061-T6 aluminum for final integration.
- Conducted coupled SolidWorks–COMSOL FEA and thermal analyses for mass minimization while maintaining a 2× safety factor.
- Presented weekly design updates to sponsors and implemented feedback into iterative improvements.
- Delivered final prototype under budget ($5 K) and on schedule, meeting all performance and manufacturability goals.

Projects

Bike Wheel ABS Prototype | *Arduino, PID Control, Mechanical Design* **Jun. 2024**

- Designed and prototyped a bicycle anti-lock braking (ABS) system integrating a DC motor, cam-follower brake tensioner, encoder feedback, and IR sensing; implemented Arduino-based PID control to detect rapid deceleration and dynamically modulate brake tension, reducing wheel lock-up.
- Built modular hardware including 3D-printed housings, custom sensor mounts, and dual limit switches for tolerance verification, reliable actuation, and repeatable testing during iterative development.

Omniwheel Cat Toy Robot | *Arduino, HC-SR04, Motor Control* **Jan. 2026**

- Designed and built a three-wheel omniwheel mobile robot integrating downward-facing laser modules and ultrasonic ranging to detect approaching objects and execute evasive maneuvers in real time.
- Implemented multi-motor PWM control, synchronized driver timing, and power distribution architecture to achieve stable omnidirectional motion and reactive obstacle avoidance.

Technical Skills

CAD/CAE: SolidWorks, COMSOL Multiphysics, Fusion 360
Programming: MATLAB, Python, C/C++, Arduino
Analysis: Finite-Element Analysis (FEA), Thermal/Optical Simulation, Parametric & Generative Design, PID Control
Tools: 3-D Printing, Oscilloscope, Soldering
Languages: English (native), Spanish (native)

Awards & Honors

Salutatorian **Jun. 2020**
Pittsburg High School (Class Rank #2/820) *Pittsburg, CA*

Golden State Seal Merit Diploma **Jun. 2020**
California Dept. of Education *Sacramento, CA*