

Luca .Guiga

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EDUCATION

University of California, Santa Cruz | Jack Baskin School of Engineering
BS Electrical Engineering, 3.12
Relevant classes: ECE 218, ECE 171, CSE 100

September 2023 – June 2027

WORK EXPERIENCE

MORI Research Institute
Research Apprentice

Los Angeles, United States | Sep. 2021 - Jun. 2024

- Designed and implemented a data acquisition system using a Raspberry Pi and Arduino, which automatically detected alignment deviations as small as 4 mm and corrected them in real-time within 200 milliseconds.
- Built a virtual database in Python, hosted on a virtual machine, to process and distribute over 1 TB of experimental data across three off-site servers, ensuring redundancy, reliability, and secure transfers through a copy protocol.
- Developed Python/Tkinter GUI enabling remote processing and visualization, reducing post-op analysis time by roughly 40%.
- Created 12 detailed CAD prototypes for custom hardware, sensor, and laser mounts, incorporating environmental sealing compliant with IP56 ingress protection standards, which led to a 95% first-print success rate for prototype components.
- Collaborated in a small research team with minimal guidance, applying self-direction, problem-solving coordination for 3 years.

PROJECTS

Mechatronics Final Project (ECE 218)

Santa Cruz, United States | Mar. – June 2026

- Evaluated 6 sensor suites and designed a modular chassis for 4 interchangeable configurations, cutting anticipated refabrication by up to 60% and helping complete the project 25% under budget.
- Redesigned the power distribution system to increase current capacity from 1 A to 5 A, a 400% increase, improving motor consistency and sensor feedback stability under changing current loads.
- Expanded sensor capacity by 50% by designing an analog interface that combined and regulated multiple sensor outputs through shared ADC inputs, increasing directional trackwire coverage by 50%.

Analog Circuits (ECE 171)

Santa Cruz, United States | Jul. – Aug. 2026

- Designed, built, and characterized analog circuits including diode networks, operational-amplifier configurations, and BJT current mirrors using LTspice simulation, benchtop instrumentation, and analytical circuit models.
- Evaluated basic, base-current-compensated, and Wilson current mirrors through controlled DC sweeps, measuring output current, compliance behavior, and output resistance while comparing experimental results against transistor-level simulations.
- Characterized amplifier gain, clipping, slew rate, frequency response, and nonlinear behavior using oscilloscopes, waveform generators, FFT measurements, and MATLAB-based data analysis to quantify deviations between theoretical, simulated, and measured performance.

Signals & Systems Laboratory (ECE 103L)

Santa Cruz, United States | June – Aug. 2026

- Analyzed periodic signals by decomposing them into frequency components using MATLAB FFT and a hardware spectrum analysis, confirming Fourier analysis principles through direct comparison of theoretical predictions and measured results.
- Demonstrated sampling theory by designing, building, and testing an analog reconstruction filter, successfully recovering original audio signals from discretely sampled data while documenting aliasing effects and strategies for mitigation.

FPGA VGA Game Design (CSE 100 Lab 6)

Santa Cruz, United States | Jan. – Feb. 2026

- Developed a real-time VGA application entirely in Verilog, implementing FPGA-based video generation, pixel addressing, color selection, and synchronized display logic to render a structured full-color game environment.
- Designed modular Verilog logic for player input, movement, object positioning, randomized timing, collision detection, and life tracking, coordinating concurrent hardware processes while maintaining correct VGA timing and graphical priority.
- Implemented layered rendering logic to prevent overlapping objects from corrupting display output, and extended the design with additional Verilog-controlled behaviors including animated apples and randomized golden apples with modified fall speed and life-restoration functionality.

Embedded Systems Design (ECE 13) Santa Cruz,

Santa Cruz, United States | Apr. – May. 2025

- Designed and implemented a real-time multiplayer Battleship game entirely in C, creating a custom serial communication protocol to coordinate moves, synchronize game states, and ensure reliable data transfer between two STM32 microcontrollers.
- Achieved an 80% win rate against instructor test AI's by implementing an optimized targeting algorithm and a robust, fault-tolerant state machine, demonstrating both efficiency and resilience under constrained hardware conditions.

Astronomical Research Collaboration (Occultation Recording)

San Diego, United States | Dec. 2022

- Conducted a field observation, capturing a confirmed visual of a comet occultation for trajectory mapping.
- Transmitted observational data for inclusion in the group's published research, contributing to international collaboration in

TECHNICAL SKILLS & INTERESTS

Technical Skills: C, Python, RISC-V Assembly, MATLAB, PSpice, Schematic Capture, Digital Logic Design, Analog Circuit Design, Microcontroller Programming (STM32, FPGA), Embedded Linux, I2C, CAN Bus, USB, Ethernet, Git, GitHub, VMware, Linux Shell Scripting, Raspberry Pi, Arduino, 3D CAD, Circuit debugging.

Extra-Curricular Activities: Ultimate Frisbee, Martial Arts, Surfing, Cooking. USA CUTA Taekwondo State Champion (2026)