

Aidan J Maldonado

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Email: ajimaldo@ucsc.edu
Phone: (408)300-2385

GitHub: [aidanmaldonado](https://github.com/aidanmaldonado)
LinkedIn: [aidan-maldonado](https://www.linkedin.com/in/aidan-maldonado)

Website: aidanmaldonado.github.io/
Location: San Jose, CA

Interests

Hello! My name is Aidan, and I aspire to research and develop methods of computational optimization for applications in neuroscience, brain imaging, and biotechnology.

Education

University of California, Santa Cruz Bachelor of Science in Computer Science Minor in Applied Mathematics	Santa Cruz, California Sep 2022 - Jun 2025 Sep 2022 - Jun 2025 GPA: 3.61
University of California, Santa Cruz Master of Science in Scientific Computing and Applied Mathematics	Santa Cruz, California Sep 2025 - Jun 2026
De Anza College Transferable Credit	Santa Clara, California GPA: 4.00
Las Positas College Transferable Credit	Livermore, California GPA: 4.00
Foothill College Transferable Credit	Los Altos Hills, California GPA: 4.00
Chabot College Transferable Credit	Hayward, California GPA: 4.00

Relevant Coursework

Data Mining, Machine Learning and Artificial Intelligence

- Introduction to Machine Learning (UCSC - CSE 40 Testout)
- Machine Learning and Data Mining (UCSC - CSE 142)
- Artificial Intelligence (UCSC - CSE 140)
- Introduction to Natural Language Processing (UCSC - CSE 143)

Software Development

- Programming Abstractions: Python (UCSC - CSE 30)
- Computer Systems and C Programming (UCSC - CSE 13s)
- Introduction to Data Structures and Algorithms (UCSC - CSE 101)
- Analysis of Algorithms (UCSC - CSE 102)
- Computational Models (UCSC - CSE 103)
- Foundations of Programming Languages (UCSC - CSE 114a)
- Introduction to Software Engineering (UCSC - CSE 115a)

Computer Hardware / Computational Optimization

- Computer Systems and Assembly Language and Lab (UCSC - CSE 12)
- Computer Architecture (UCSC - CSE 120)
- Principles of Computer Systems Design (UCSC - CSE 130)
- Engineering Principles of Electronics (UCSC - ECE 30)

- Quantum Computing (UCSC - CSE 109)
- Distributed Systems (UCSC - CSE 138)
- Computational Methods and Applications (UCSC - AM 147)
- Numerical Methods for the Solution of Differential Equations (UCSC - AM 213b)
- Convex Optimization (UCSC - AM 229)
- Introduction to High Performance Computing (UCSC - AM 250)

Statistics

- Introduction to Probability Theory (UCSC - STATS 131)
- Classical and Bayesian Inference (UCSC - STATS 132)

Calculus and Differential Equations

- Calculus I, II, III (UCSC - MATH 19b, MATH 23a, MATH 23b)
- Ordinary Differential Equations (UCSC - MATH 24)
- Numerical Methods for Engineers and Vector Calculus (UCSC - AM 100)
- Dynamical Systems (UCSC - AM 114)
- Introduction to Partial Differential Equations (UCSC - AM 112)

Mathematical Reasoning and Abstract Thinking for Computation

- Linear Algebra (UCSC - MATH 21)
- Applied Discrete Mathematics (UCSC - CSE 16)
- Modern Algorithmic Toolbox (UCSC - CSE 105)
- Graph Theory (UCSC - MATH 115)
- Real Analysis (UCSC - MATH 105a)
- Spectral Graph Theory (UCSC - CSE 258)

Critical Pedagogy, Research, and Team Building

- Theory and Practice of Peer-Guided Learning for Tutors and Learning Assistants (UCSC - STEV 96)
- Research Explorations (UCSC - CMPM 15)
- Collaborative Research Experience in Engineering (UCSC - CMPM 118)
- Seminar in Applied Mathematical Modeling (UCSC - AM 280b)

Cultural and Humanities Exploration

- Introduction to the Bible (UCSC - HIS 5c)
- Digital Art (UCSC - Art 135)
- Introduction to Art History (Los Positas - ART 1a)
- Magic, Religion, Witchcraft and Healing (Chabot - ANTH 12)
- Native Feminisms (UCSC - ANTH 130o)
- Video Game Narrative Culture (UCSC - FILM 80v)
- Elementary Japanese I - (Foothill JAPN 1)

Research Labs

Protein Synthesis Modeling - Razvan Marinescu MDML Research Lab | Undergraduate Researcher Dec 2023 - Dec 2024
 Assisting in research under the supervision of a professor and their Ph.D. students, where technical skills in Bayesian Statistics, Machine Learning, Discrete Mathematics, Python, and data visualization with libraries such as NumPy, SQL, and Pandas are being applied. Actively working with peers during 3-hour meetings twice a week and more individually to apply a Neural ML model to speed up the process of simulating protein self-assembly in viruses with the goal of a human brain cell simulation for medical applications. Familiarity working with tools such as Bizon and data visualization software.

Computer Vision Video Recognition - Eric Wang Research Lab Jan 2023 - Jun 2023
 Undergraduate Researcher and Data Scientist
 Creating and training a machine learning model to recognize the features of a video by gathering data on dozens of videos, drafting reasoning, counterfactual, future prediction, and domain-specific inquiries to create a tool comparable to Google's Bard in terms of video recognition capabilities. Tasked with developing a model with equally efficient output given resource constraints.

Projects

- Rallie** | *FastAPI, MongoDB, Chroma, GeminiAPI, Docker, Pydantic, Uvicorn, Cloudflare* CruzHacks 2025
Developed a backend for a bureaucracy-assistance web app that interviews users and stores responses in both a MongoDB document database and a Chroma vector store. Implemented session-based user authentication, Retrieval-Augmented Generation (RAG), and prompt injection to deliver personalized, context-aware solutions. Integrated frontend endpoints with a Cloudflare-hosted server, database, and Gemini-based reasoning model.
- Double Pendulum Simulation** | *MATLAB, Numerical Integrators, OOP* March 2024
Simulated a nonlinear chaotic double pendulum system using Euler, Trapezoidal, and Runge-Kutta integration methods. Implemented an object-oriented architecture with modular classes for state representation and simulation control. Created visualization tools for animated pendulum trajectories and comparative performance analysis. Benchmarked each integration method against MATLAB's ode45 solver across varied initial conditions and step sizes to evaluate accuracy and computational efficiency.
- Siren** | *Python, NumPy, Numerical Methods* Present
Developing a music signal processing system to algorithmically decompose audio tracks into distinct components (vocals, percussion, instrumentation) using numerical methods and spectral analysis. Designing two operational modes: offline decomposition and real-time audio stream analysis via microphone or microcontroller input. Expanding toward automatic sheet music generation through onset detection, pitch tracking, statistical inference, and temporal alignment of transcribed notes with original audio.
- Language Modeling & Machine Learning Tools** | *Python, NumPy, Matplotlib* Jun 2024
Developed an n-gram language model with corpus perplexity monitoring to learn text patterns and evaluate likelihood-based predictions. Engineered diverse next-word selection strategies, such as temperature scaling, k-random sampling, and greedy decoding, to optimize generative output quality. Created a custom Matplotlib-based visualization module to analyze model performance and token distributions. Built supporting ML components from scratch, including supervised (linear/logistic regression, RNNs) and unsupervised (K-means) models using only foundational math and core Python libraries.
- Penny Stock Forecasting with LSTM Models** | *PyTorch, SQL, TensorFlow/Keras, HTML/JS, Flask, Polygon.ioAPI* Jul 2024
Developed a web app using MySQL, Flask, and deep learning frameworks (TensorFlow/Keras, PyTorch) to predict penny stock prices, utilizing an LSTM model with a prediction loss of <0.004 and integrating real-time stock data from Polygon.io. Created an interactive frontend with HTML/JavaScript to display stock forecasts and optimal buy/sell times based on a specified horizon, enabling user interaction and communication with the backend model.
- Personal Website** | *HTML, CSS, JS* Jun 2024
Published a website on GitHub to showcase my projects, research, photography, and methods of contact. Spent approximately 16 hours learning HTML, CSS, and JS while constructing the first iteration over the summer.
- Huffman Encryption Project** | *C* May 2023
Developed a C-based text encryption and decryption program utilizing the Huffman encoding algorithm, which applied data structures such as Priority Queues, Data Buffers, and Bitwriters to transform the character data, along with my expertise in file handling, debugging, and memory management. Demonstrated a thorough understanding of and proficiency in implementing complex algorithms to transcribe encrypted input message strings safely.
- Color Blindness Simulator** | *C* May 2023
Developed a C-based image manipulation program that transformed any BMP to simulate how people with various forms of color blindness, such as deuteranopia, perceive the world. Applied proficiency in file handling, buffer writing, transformation matrices, bitmasking, and image metadata processing to write to an output image with zero memory leaks.
- Beleaguer** | *Python, PyQt, NumPy, C++, Godot* Present
Developing a virtual adaptation of my board game in Python using UI libraries such as PyGame and PyQt, and data handling with Pandas NumPy to control the logic of the board itself and piece characteristics. Knowledge of these libraries was self-taught over 9 months. Rebuilt the project starting in July 2023; now utilizing C++ with the Godot game engine. Leveraging C memory management

capabilities from CSE 13s and 101 cojoined with self-taught for three months; class handling in C++, game engine usage, and sprite work.

Professional Experience

- Learning Support Services** | *Group Tutor* Sep. 2023 - Present
Prepare and facilitate three weekly tutoring sessions across multiple quarters for courses including Discrete Mathematics, Data Structures & Algorithms, Linear Algebra, and Computer Systems & C Programming. Support groups of up to 15 students by embodying LSS's core values of active, equity-minded, and student-centered learning and feedback, and fostering strong, metacognitive study habits reinforced through schema-building and guided use of external resources. Regularly collaborated with co-tutors, mentors, and supervisors to reflect, iterate, and implement inclusive pedagogy aligned with STEV 96 principles. Honed skills in punctual communication, intentional presence, time management, and weekly scheduling while supporting a diverse student population.
- Baskin Engineering** | *Group Tutor & Course Assistant* Dec. 2024 - Present
Prepare and facilitate several weekly tutoring sessions across multiple quarters for Classical and Bayesian Inference and Data Structures and Algorithms in Python (DSAP). Support groups of up to 12 students by answering their questions, engaging them in peer-interactive activity, and fostering strong, metacognitive study habits and constructive, student-centered feedback. Collaborate closely with the course instructor to align support materials, provide grading assistance, and reinforce learning outcomes. For DSAP with Professor Montazeri, contribute several hours weekly to course design via Zoom meetings, grading, discussion section facilitation, and exam proctoring and review.

Extracurricular

- Hackathon** | *CruzHacks* April 2025
Participated in a 4-person team and developed the backend infrastructure for Rallie, a bureaucracy-assistance web app. Over 2 days: brainstormed, designed, implemented, worked closely with the frontend team, and refactored code to publish a working build.
- Hackathon** | *ForAllSecure* April 2023
Participated in a ForAllSecure Hackathon, learned about program fuzzing, and applied it to small tasks.
- Santa Cruz Artificial Intelligence** | *Club Member* Sep 2023 - Present
Engage in weekly workshops, study sessions, community outreach, informational lectures, hackathons, and group projects with peers and mentors who share a passion for everything related to Machine Learning and Artificial Intelligence.
- Neurotech UCSC** | *Club Member* Sep 2022 - Present
Attend weekly meetings both with a general body and with 4-8 team members to work on the machine learning and data processing aspect of our Virtual Reality Electromyography project.
- Shutterslug Photography** | *Club Member* Sep 2022 - Present
Took an interest in photography in 2021 and keep practicing/learning about it every day. Attend weekly meetings with peers to showcase our works and findings.
- Bass** Feb 2023 - Present
Started playing the bass guitar and practiced about 4 hours a week. Learning music theory and applying mathematical reasoning.
- Gym** Feb 2023 - Present
Train in the gym roughly four days a week and guide multiple friends who recently started.
- Photography, Animation, and Video Rendering** Feb 2016 - Present
Passionate about digital photography as well as video animation and rendering

Technical Proficiencies

Programming Languages

Python, C/C++, Rust, Haskell, SQL, HTML/CSS/JavaScript, MATLAB

Frameworks and APIs

NumPy, Matplotlib, Pandas, Polars, SciPy

PyTorch, TensorFlow / Keras, SNN Torch, scikit-learn

Flask, FastAPI / Uvicorn, Pydantic, Gemini FlashAPI

Database Tools

MongoDB, SQLite, SQL, PostgreSQL

Chroma, Vectara

Pandas, Polars

Developer Tools and Version Control

VSCode, PyCharm, Vim

Git, Makefiles, Jupyter Notebooks

SSH, SLURM, Google Workspace

Technologies

Docker, Linux (Ubuntu), VirtualBox, Parallels

UCSC Supercomputers: Hummingbird, Bizon, Lux

Languages

Fluent: English, Spanish | Learning: Japanese

Certifications and Awards

CRLA Level 2 Certification (LSS)

Dean's Honor List (UCSC)

Sep 2024

Sep 2023 - Present