

# Mario Daniel Panuco

☎ (408) 466-3553 | ✉ mdpanuco@gmail.com | 🏠 mdpan.dev | 📷 MarioDanielPanicu | 🌐 Mario-Daniel-Panicu

## Skills

**Languages:** Python, C++, C, Rust, Fortran, Mojo, MATLAB, Bash, SQL

**Quantitative Methods:** Monte Carlo Methods, Numerical Linear Algebra, Numerical Differential Equations, Numerical Analysis

**Scientific Computing:** Jax, Pytorch, NeuralOperators.jl, NumPy, SciPy, Pandas, Polars, JAX, Matplotlib, Scikit-learn, XGBoost

**Performance Computing:** CUDA, MPI, OpenMP, BLAS/LAPACK, Parallel Algorithms, MLIR, XLA

**Software Engineering:** Cargo (Dioxus, Clap, Axum, Tokio), FastAPI, Streamlit, Git, Docker, Unix, CMake, CI/CD, Unit Testing, Shell Scripting

**Cloud / Tools:** AWS, Google Cloud Platform, Nix/NixOS, Markdown, Jupyter, Latex, AI tools (Claude Code, Codex, Hermes)

## Education

### University of California, Santa Cruz

Santa Cruz, CA

MASTER OF SCIENCE, SCIENTIFIC COMPUTING AND APPLIED MATHEMATICS (GPA: 3.96)

Fall 2024

- Relevant courses: Dynamical Systems, Fluid Mechanics, Numerical Methods for Differential Equations, Applied PDEs, Computational Genomics, High Performance Computing, Numerical Linear Algebra.
- Research: Computing numerical solutions to the Kuramoto-Sivashinsky equation using Neural Operators.

### University of California, Santa Cruz

Santa Cruz, CA

BACHELOR OF SCIENCE, COMPUTER SCIENCE ENGINEERING (GPA: 3.49)

Spring 2023

- Honors: UCSC Campus Merit Hihn Scholar
- Relevant courses: Algorithm Analysis, Modern Algorithmic Toolkit, Systems Design, AI, NLP, Computational Methods and Applications.

## Projects

### Payment-Integrity AI Risk Scoring System ("Resolvent") — JAX, FastAPI, Docker

INDEPENDENT PROJECT

June 2026

- Designed, developed, tested, and end-to-end payment-integrity risk-scoring prototype transactions, combining a JAX logistic-regression classifier, a scikit-learn anomaly detector, and a graph-diffusion feature, served through a FastAPI prediction endpoint.
- Documented model architecture, evaluation results, security assumptions, residual risks, and conditions that would trigger re-assessment.
- Built a Streamlit dashboard so analysts can triage flagged transactions, inspect model explanations, and record dispositions.
- Delivered the system with containerized builds (Docker), automated linting and testing via CI (GitHub Actions), and reproducible environments (Pixi/uv) — producing a cloud-deployable, auditable training-to-serving pipeline.

### Computational Genomics Library - Mojo

INDEPENDENT PROJECT

December 2025 - Present

- Designing a performance-oriented computational genomics library in Mojo, focusing on algorithms with clear data-parallel structure.
- Implementing GPU kernels for sequence-level operations such as k-mer extraction, sliding-window transforms, and genomic signal processing.
- Exploring batched, banded dynamic programming and wavefront-style parallelism for sequence alignment on GPUs.
- Benchmarking CPU and GPU implementations to study scaling behavior and memory-performance trade-offs using Mojo's MLIR compilation.

### Neural Operators for Scientific Simulation (JAX)

INDEPENDENT RESEARCH INTEREST

2024 - Present

- Studying neural operator frameworks (e.g., Fourier Neural Operators, DeepONets) for learning solution operators of PDE-governed systems
- Implementing neural operators in JAX with automatic differentiation, vmap/pmap, and XLA-compiled GPU execution
- Exploring applications in scientific machine learning, including fluid dynamics and surrogate modeling for high-dimensional simulations
- Investigating whether operator-based models can generalize to biological signal modeling problems (e.g., genomic coverage tracks)

### Linear Algebra Library — Fortran & C++

SCHOOL PROJECT (REIMPLEMENTED IN C++)

January 2024 - May 2025

- Developed a LA library for scientific computing, implementing matrix operations, factorizations (LU, QR, Cholesky, SVD), and eigenvalue solvers.
- Original implementation in Fortran, followed by a reimplement in modern C++ with improved modularity and extensibility.
- Integrated LAPACK and evaluated solver performance, numerical stability, and precision across implementations.
- Benchmarked algorithms to compare performance trade-offs between Fortran and C++ implementations.

### Parallelized Conway's Game Of Life - Fortran

SCHOOL PROJECT

April 2024 - June 2024

- Developed a parallelized version of Game of Life, utilizing MPI for inter-process communication and SIMD for vectorized computations.
- Applied domain decomposition to split the simulation grid across processors, improving parallel scalability on distributed-memory systems.
- Used non-blocking MPI operations to optimize boundary communication between processes, minimizing synchronization delays.
- Performed theoretical analysis of computational complexity as a function of scaling with processors.

### Multi-Threaded HTTP Server - C

INDEPENDENT PROJECT

March 2023 - June 2023

- Designed and Implemented an HTTP server in C99, conforming to POSIX standards, with a thread pool architecture.
- Utilized synchronization mechanisms (mutexes, condition variables), ensuring atomic and coherent request handling, optimizing for high-throughput and low-latency performance.
- Developed an logging system to track requests, ensuring correct parallelization and facilitating debugging, performance, and security analysis.

## Work Experience

### Alta Construction & Engineering Inc.

San Jose, CA

ADMINISTRATIVE SYSTEMS MANAGER

October 2024- Present

- Managed administrative and financial operations: invoicing, payroll records, vendor payments, cash flow tracking, and project documentation.
- Built reusable templates and document automation workflows to standardize estimates, invoices, contracts, and permit forms.
- Coordinated client, vendor, subcontractor, and municipal documentation throughout the project lifecycle.

### Baskin Engineering, University of California, Santa Cruz

Santa Cruz, CA

TEACHING ASSISTANT - AM 10 - MATHEMATICAL METHODS FOR ENGINEERS 1

January 2024 - June 2024

- Led weekly discussions on complex variables, linear algebra, and differential equations, while introducing relevant engineering applications.
- Graded assignments and exams, offering constructive feedback to enhance students' grasp of key concepts.
- Collaborated with instructors to ensure consistency between lectures and discussion materials, and maintained grading accuracy.

## **Physics Department, University of California, Santa Cruz**

*Santa Cruz, CA*

TEACHING ASSISTANT - PHYS 116A - MATHEMATICAL METHODS FOR PHYSICISTS

*September 2023 - December 2023*

- Led discussions on linear algebra, infinite series, and ordinary differential equations, providing support for students' problem sets.
- Graded assignments and exams, providing feedback to support students' understanding and application of complex mathematical methods.

## **Baskin Engineering, University of California, Santa Cruz**

*Santa Cruz, CA*

GRADER/READER FOR CSE 140 - ARTIFICIAL INTELLIGENCE

*April 2023 - June 2023*

- Evaluated assignments and exams on key AI topics, including constraint satisfaction problems, adversarial search, Markov Decision Processes, and reinforcement learning.
- Provided comprehensive feedback to enhance students' understanding of AI principles and their practical applications.
- Collaborated with faculty to ensure fairness and resolve grading discrepancies.

## **Learning Support Services, University of California, Santa Cruz**

*Santa Cruz, CA*

SUPPLEMENTAL INSTRUCTION LEADER - CSE 20 - INTRODUCTION TO PYTHON

*January 2023 - March 2023*

- Provided supplemental instruction in Python, delivering in-person sessions and developing Jupyter Notebooks to enhance student learning.
- Guided students in debugging strategies, applying algorithmic design patterns, and optimizing code for time and space complexity.

## **Learning Support Services, University of California, Santa Cruz**

*Santa Cruz, CA*

SMALL GROUP TUTOR - CSE 102 - INTRODUCTION TO ALGORITHM ANALYSIS

*August 2022 - December 2022*

- Facilitated peer-centered learning sessions focused on algorithm design patterns and optimization for time and space complexity.
- Mentored students in formalizing mathematical abstractions and applying algorithmic thinking to solve complex problems.