

Jacob B. Collins

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EDUCATION

California State University, Chico

M.S. Computer Science | Expected December 2026

B.S. Computer Science | Cum Laude | Completed December 2025 | **GPA: 3.74**

Data Science Certificate | Completed December 2025

HPC & Quantum Computing Club | President

CSCI Research Enthusiasts Club | President

SKILLS

Programming: C/C++, Python, R, MPI, OpenMP, Pthreads, CUDA-Q, Qiskit, UDS, Winsock

Tools & Libraries: OpenCV, NetworkX, PyTorch, Slurm, Docker, Singularity, SDL, Git CLI, CMake, GCE

PUBLICATIONS

Mission Planning Simulation and Design Software Scaling for Shared and Distributed Memory Computing

- * Modified NASA's GMAT to run distributed Monte-Carlo simulations.
- * Used OpenMP to parallelize 6-DOF Runge-Kutta integration.
- * Automated performance testing with Bash.
- * *2,387% Speedup* on a 62-node system (*96.2% parallel*).

Quantum Semiprime Factorization: Leveraging Grover's Algorithm for Efficient Prime Decomposition

- * Wrote a generalized quantum circuit construction & testing program.
- * Utilized Grover's Algorithm to find prime factors.
- * Developed a method requiring asymptotically fewer qubits.
- * Ran tests as Slurm jobs on SDSC Expanse with custom Singularity container.

IEEE Aerospace Conference 2026

Tools: MPI, OpenMP, CMake, Bash, C++

CSCSU 2025 Research Conference

Tools: Slurm, Singularity, CUDA-Q, C++

PROJECTS

Distributed Prime Number Sieve

- * MPI for distributed memory scaling, OpenMP for shared memory scaling.
- * Supports semi-primes below 2^{128} , and primes below 2^{64} .
- * Ran tests via Slurm on SDSC Expanse using 16 nodes x 128 threads/node.
- * *12,655% speedup (99.3% parallel)* observed from prime search to 10 billion.

Low-Latency Cross-NAT Multiplayer Game

- * Fully functional cross-platform game engine and server from scratch in C++.
- * Matchmaking server hosted on Google Cloud Enterprise (GCE) VM.
- * Client-side network functions written for both UNIX sockets and Winsock.
- * Implemented UDP Hole Punch for clients to achieve cross-NAT P2P.

Iterative Network Simulation

- * Simulated an iterative adaptation of the prisoner's dilemma.
- * Conducted experiments to analyze behavior on varying network structures.
- * Generated animations to visualize system evolution over time.

Road Network Processing & Analysis

- * Designed a road network extraction & processing pipeline for OSM data.
- * Prioritized memory efficiency by parsing file streams with low overhead.

Tools: Slurm, MPI, OpenMP, C

GitHub

Tools: UDS, Winsock, CMake, GCE, SDL, C++

GitHub

Tools: Python, NetworkX

GitHub

Website

Tools: Python, NetworkX, R, Bash

EMPLOYMENT

i-SAIL Lab Assistant

- * Managed budget documentation, purchase orders, and technical diagrams.
- * Designed 3D virtual environments to plan the in-progress computing lab.
- * Primary on-site liaison for students in the summer research program.

Lead Student Research Assistant

- * Coordinated student research efforts involving quantum computing.
- * Instructed students in designing and simulating quantum circuits.

California State University, Chico

June 2025 – August 2025

Dr. Sam Siewert

Chico State Enterprises

June 2024 – December 2024

Dr. Jaime Raigoza, Dr. Sam Siewert