

Tony Cao

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EDUCATION

Swarthmore College

2021 - 2025

BA in Computer Science and Mathematics (GPA: 3.80 / 4.00)

Swarthmore, PA

Relevant Coursework: Machine Learning, OS, Parallel & Distributed Systems, Randomized Algorithms, Statistical Methods II, Probability, Stochastics, Partial Differential Equations, Differential Geometry

EXPERIENCE

Research Assistant

Jun 2024 – Aug 2024

Dive Into Systems (eBook) — [GitHub](#) 📄

Swarthmore, PA

- Developed interactive exercises for assembly and CPU architecture chapters of open-source CS textbook using jQuery and D3.js, improving learning experience for undergrads at 60+ institutions
- Created C interpreter, forks simulator, and ARMv8/x86 fuzzer in JavaScript, enabling automated problem generation
- Collaborated closely with professors and colleagues to align UI/UX with pedagogical goals, incorporating user feedback for student-centered designs

Software Engineer Intern

Jun 2023 – Aug 2023

GMD Protocol (Fintech Startup)

Ho Chi Minh City, Vietnam

- Engineered order execution system and job scheduler for DeFi trading, automating traders' workflows and significantly reducing trade execution time
- Built an order management product to enable leveraged trades on decentralized exchanges using Python, Docker and Google Cloud Platform, securing \$XXX,000 in external funding
- Built a secure key management layer on MongoDB, enabling password protection of temporary wallets with bcrypt, incorporating secret keys and per-user salt, added protection mechanism to remotely halt all decrypt operations

PROJECTS

Hypercubic Peer-to-Peer Network | C, Python, R

[GitHub](#) 📄

- Authored a TCP peer-to-peer chat network that delivers logarithmic hops count via a hypercube topology
- Developed neighbor assignment logic to handle dynamic peer joins and leaves, maintaining consistent routing tables
- Measured network performance on 256 nodes network using Python and shell scripts, visualized profiling data with matplotlib and R

Music Recommender Webapp | Python, TypeScript

[GitHub](#) 📄

- Developed a full-stack “anti-recommendations” web application using React and a Flask REST API
- Built a parallel ETL pipeline with Python futures and pandas to mine, sanitize, and validate a 10,000-track dataset
- Integrated real-time Spotify API lookups using Spotipy, applying debouncing and rate limiter to maintain API compliance and boost responsiveness

SIMD Game of Life Engine | C

[GitHub](#) 📄

- Accelerated GOL engine using pthreads and low-level optimization, achieve linear scaling and 120x total speed up
- Applied SIMD optimization with SSE and AVX intrinsics, bitmask and bit-packed data structure
- Used gprof to identify hotspots and inline critical functions, improving cache locality and reducing runtime by 40%

PRNG Behavior Analysis | C++, Python, R

[Report](#) 📄

- Examined long-term behavior of mt19937 number generator in C++ by processing 9 TB of data using NIST test suite
- Performed analysis over 360,000 blocks of 25 MB generated data, compared collected p-values against theoretical distribution of bits ratio, oscillation frequency, and template occurrences
- Visualized random behavior with Python and R, presented findings on mt19937 reliability as a non-cryptographic PRNG

SKILLS

Languages: C, C++, Python, JavaScript, TypeScript, R, Rust, Bash

Tools and Libraries: MongoDB, React, D3.js, UNIX, ARMv8/x86 assembly, GCC, Git, Linux

Concepts: Distributed Systems, Parallel Programming, Databases, Low-level Architecture