Harrison Nicholls

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EDUCATION

Reed College   Portland, OR
B.A. in Computer Science, Minor in Music   August 2019 – May 2023

− Senior Thesis: *Formal Verification of Google's QUIC Protocol using Tamarin Prover*

EXPERIENCE

Stanford University (Tech Impact and Policy Center)   Remote
Software Engineering Consultant   2026 – Present

− Designed, architected and built a full-stack platform with national reach (assessing national policy for phone-bans in school) for exploratory analysis of longitudinal intervention survey data, enabling users to see distributional changes across timepoints before and after the phone-ban intervention. Designed a config-driven architecture enabling researchers to define versioned survey analysis specs in human-readable form without touching application code

− Designed end-to-end ingestion and analysis pipelines, transforming raw survey exports from various sources into structured analytical outputs for interactive exploration, allowing non-technical end users to go from raw data to analysis on a user-friendly platform

− Sole engineer across backend and frontend; containerized the application with Docker and collaborated with Stanford infrastructure engineers to deploy within Stanford-managed Kubernetes environment.

Penumbra Security (Cryptography Standards Lab)   Portland, OR - now remote
Information Security Engineer   2024 – Present

− Built a full-stack private RAG system hosted fully in-house, enabling secure upload and information retrieval from sensitive documents across the internal network without external LLM tooling or hosted LLM integration frameworks, saving engineers many hours fact-finding with large volumes of technical documentation. System and codebase were later adopted by the lab's parent organization to launch their AI initiative for cybersecurity compliance workflows in Europe

− Re-architected our lab's report-writing workflow from manual JSON handoff into a GitLab-based system on a self-administered Linux server, where versioned project files trigger CI jobs that generate NIST-submittable artifacts.

− Built an API over a database that syncs report data from Markdown project files on each push and supports JSON and Markdown generation, enabling automated report workflows and local LLM-based agent jobs, significantly reducing manual labor and human error during the report writing process

− Evaluated cryptographic software and entropy sources against NIST cryptography (ISO/IEC 19790) standards, collaborating directly with security engineers and working in codebases across a variety of technical stacks. Entropy work included contributing to the wolfSSL library

Steve Jobs Archive   Remote
Fellow   2023 – 2024

− Designing and developing a novel music composition platform (ToneGram), an alternative to black-box AI music generation that empowers composers to define and iterate on their own musical grammars. Now in development with a collaborator.

Stanford Linear Accelerator Center (SLAC)   Palo Alto, CA
Software Engineering Intern, Technology Innovation Directorate   Summers 2020 – 2022

− Implemented dynamic plotting and live sensor readout tools using PyQt for the Technology Innovation Directorate Electronics Engineering group, enabling scientists to quickly visualize and debug real-time sensor data during hardware development

− Contributed significant Python code for several research projects (CMB-S4 telescope sensor array, medical scanner)

Projects

ToneGram Remote
SJA Fellowship 2023 – Present

– Selected as 1 of 9 young innovators in the United States to become an inaugural Steve Jobs Archive Fellow, working on an independent project at the intersection of tech and the arts
– Reimagined generative music composition software using generative grammars, as opposed to black-box AI systems
– Designing a public, collaborative archive of musical fragments to enable automatic credit attribution to individual musicians
– Presented to a large audience of tech and arts leaders at the Steve Jobs Archive Annual Retreat (2024)

Academic Writing

- *Formal Verification of Key Exchange Protocol Security with Tamarin Prover*, Undergraduate Thesis, Reed College (2023)

  – Modelled Diffie-Hellman and a simplified QUIC 0-RTT handshake protocol in the Tamarin prover language; produced machine proofs of security properties.

Skills

- **Domains** Software, Cryptography/Security, RAG pipelines, Formal Verification/Machine Proofs,Technical Writing, Music
- **Technologies** Python, Flask, Docker, Linux, CI/CD, ReactJS, JavaScript/HTML/CSS, REST APIs, PostgreSQL, vector databases, Firebase, Tamarin Prover
- **Languages (human)** Spanish (proficient), Japanese (elementary), Russian (elementary)

Awards and Honors

- **Steve Jobs Archive Fellowship** Selected as 1 of 9 recipients for the nationally competitive Steve Jobs Archive Fellowship, awarded substantial funding for a yearlong project
- **Post-Reed Opportunity Grant** Awarded funding through the Post-Reed Opportunity Grant (PROG) to attend the Crypto 2023 conference
- **Reed College Summer Research Grant** Awarded funding to pursue cryptography research extending my thesis with my advisor after graduation
- **Reed College Commendation for Academic Excellence** Received Reed College commendation for academic excellence my senior year

Personal

- Volunteering

  – I play violin as a volunteer in the Peninsula Symphony Orchestra

- Interests

  – I like cooking somewhat elaborate meals, bouldering, and classical music. I also spend time writing music and playing violin at home with my partner.