Natalie Popescu

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- 5+ years' experience designing and building systems and tools for safety, security, and privacy.
- 2+ years' experience tutoring and TAing for various computer systems courses.
- Interested in systems for good, operating and distributed systems, security and privacy, programming languages and techniques, and cloud and edge computing.

Projects & Experience

Princeton University | ***PhD Student*** Sep. 2019 - Current

- Designed SCUBA, the first end-to-end encrypted framework to provide applications with strong consistency (e.g. multi-key transactions) in the face of a Byzantine central server and other clients who may try to compromise consistency.
  - Impact: Enables user-facing applications with a wider set of consistency requirements to leverage end-to-end encryption.
  - Contributions: Built the client-side SCUBA framework using Olm's implementation of Signal's double ratchet encryption protocol. Helped build the client-side, blockchain-backed message ordering validation scheme central to SCUBA's consistency guarantees. Built mechanisms for checking access control and application invariants, and applying valid operations to a simple key-value store. Finally, built various SCUBA applications and benchmarked their end-to-end performance.
  - Implemented the client-side research prototype in about 6K lines of Rust, and four command-line applications, each of which is between 800 and 900 lines of Rust.
  - Paper is currently in submission to top-tier security conference, IEEE S&P 2024.
- Helped design Nader, a tool that allows software developers to reintroduce bounds checks in Rust code without exceeding developer-specified performance thresholds.
  - Impact: Minimizes potential buffer overflows in any Rust project that Nader is run on, including its dependencies.
  - Contributions: Built Web crawling and benchmarking infrastructure to download and benchmark the most downloaded Rust libraries with and without developer-elided bounds checks, to show their performance impact. Helped evaluate Nader on various popular open source Rust projects.
  - Implemented about 1K lines of Python and bash for the crawler, benchmark harness, and result aggregation/visualization.
  - Paper published in top-tier programming languages conference, OOPSLA 2021.

University of California San Diego | ***Assistant Researcher*** Apr. 2018 - June 2019

- Helped evaluate Constant-Time WebAssembly (CT-Wasm), a modification of WebAssembly (Wasm) that supports building constant-time cryptographic primitives for the Web.
  - Impact: Enables both client and server cryptography to be information flow secure and free of timing side channels.
  - Contributions: Ported low-level cryptographic primitives from C into Wasm/CT-Wasm, and benchmarked them against their JavaScript implementations.
  - Ported Salsa20, SHA-256, and the TweetNaCl library to CT-Wasm: Salsa20 and SHA-256 in hand-written Wasm/CT-Wasm (about 450 and 300 LOC, respectively), and TweetNaCl in compiled Wasm/CT-Wasm.
  - Paper published in top-tier programming languages conference, POPL 2019.

Lyra Health, Inc. | ***Engineering Intern*** June 2017 - Sep. 2017

- Created dynamic Web pages for Lyra's Web application using CSS, JavaScript, and React/Redux.

Technical Skills

Programming Languages | Proficient: Rust, C/C++, JavaScript, TypeScript, Python, Go, Java; Prior Experience: SQL, OCaml, Haskell

Tools | Proficient: Linux, command scripting (bash), version control (git), visualization (tikz), cloud experiment infrastructure setup (CloudLab); Prior Experience: containerization (Docker), Web app development (Vue, CSS, HTML)

Education

Doctor of Philosophy | ***Computer Science*** Sep. 2019 - May 2025 (expected)
Master of Arts | ***Computer Science (GPA 3.43)*** Sep. 2019 - Dec. 2022
Princeton University | Advisor: Amit Levy

- Relevant Coursework: Advanced Computer Systems, Advanced Computer Networks, Advanced Topics in Computer Science: Operating System Trade-Offs: Performance, Extensibility, and Security
- Relevant Awards & Honors: 2021-2022 Microsoft Research PhD Fellow

Bachelor of Science | ***Molecular Biology (GPA 3.71), Computer Science (minor, GPA 3.89)*** Sep. 2013 - June 2018
University of California San Diego

- Relevant Coursework: Computer Organization and Systems Programming, Advanced Data Structures, Software Engineering, Principles of Computer Operating Systems, Programming Languages: Principles and Paradigms

Other Publications

Faasten: An Architecture and Implementation for Securing Cloud Applications
Yue Tan, Gongqi Huang, Natalie Popescu, Amit Levy