Jacob Ginesin

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Education

Northeastern University Aug 2021 - (Expected) May 2025
BS in Mathematics, BS in Computer Science *Boston, MA*

- **GPA**: 3.6/4.0
- **PhD-Level Coursework**: Algorithms, Advanced Algorithms, Computer Systems, Analysis 1, System Verification, Formal Methods & Distributed Systems
- **Other Coursework**: Advanced Linear Algebra, Advanced Logic, Advanced Group Theory, Logic and Computation, Number Theory 1 & 2, Partial Differential Equations & Fourier Series
- **Activities**: Wireless Club Treasurer, NUCCDC Team, GammaTau, MathEMA Peer Mentor

University of College Dublin (Study Abroad) Aug 2021 - Dec 2021

- **GPA**: 3.8/4.0 *Dublin, Ireland*

Experience

Research Assistant Feb 2022 - Present
Network and Distributed Systems Security Lab (NDS2) at Northeastern University *Boston, MA*

- Formally verifying distributed protocols (SCTP, Matrix), automated attack discovery
- Improving automated attack and patch synthesis techniques with formal methods

Intern Dec 2023 - Jan 2024
Trail of Bits *Remote*

- Formally analyzed and verified cryptographic protocols proposed by Meta, Dropbox
- Exposed flaws in protocol design and proposed rectifications

Visiting Student June 2023 - Present
University of Oxford *Oxford, UK*

- Optimized automatic formal verification algorithms through developing, formalizing, and evaluating heuristics
- Wrote an automated reasoning library including model checking and automata algorithms (available upon request)
- Ongoing work finishing up a paper

Teaching Assistant for Foundations of Cybersecurity (CY2550) Jan 2023 - May 2023
Northeastern University *Boston, MA*

- Held bi-weekly office hours to assist students with foundational cybersecurity knowledge
- Graded assignments & provided students with feedback

Research Assistant Jun 2022 - Aug 2022
Information Sciences Institute at University of Southern California *Los Angeles, CA*

- Studied DNS root server security, measured historical trends
- Supervised by Jelena Mirkovic & funded by National Science Foundation grant

Projects

** denotes code available upon request*

- **Automated Program Repair***. Developed, implemented, and proved a symbolic automated program repair algorithm for finite automata. Draft. Poster.
- **Code Editing LLM Evaluation***. Hand-crafted benchmarks and metrics to evaluate language models' ability to edit code. Included in Starcoder2. Paper in preparation.
- **Formally Verified Raft***. Formally modeled and verified the Raft consensus algorithm with the SPIN model checker. Project for CS7670.
- **Coq and Lean MultiPL-E Support**. Implemented first-order transpilers from Python to Coq and Lean to support neural code generation benchmarking with humaneval tests. Code
- **Linux Rootkit***. Linux kernel module-based rootkit that can elevate users, hide processes, and hide itself. Includes an ICMP backdoor for persistence.
- **Tunnelbees**. SSH honeypot that can securely let a user through via a Schnorr zero-knowledge handshake. Code
- **Arch-based OS**. Highly customized Arch Linux-based operating system. Used by me for all daily tasks. Code

Research

** denotes equal contribution*

1. Jacob Ginesin*, Max von Hippel*, Evan Defloor, Cristina nita-Rotaru, Michael Tüxen. "A Formal Analysis of SCTP: Attack Synthesis and Patch Verification." *In Submission to USENIX Security 2024.* Link.

2. Federico Cassano, Charles Bershatsky, Jacob Ginesin, Sasha Bashenko. "SafeLLVM: LLVM Without The ROP Gadgets!" *arXiv preprint arXiv:2305.06092.* Link.

3. Jacob Ginesin, Christoph Haase, "Language Bounds from Regular Expressions: Extractions and Applications" (Poster).*Joint Mathematical Meetings, 2024.* Link.

4. Jacob Ginesin, Jelena Mirkovic. "Understanding DNS Queries at B-Root." *Proceedings of the IEEE/ACM Conference on Big Data Computing, Applications and Technologies, 2022.* Link.

Technical Skills

Languages: Python, C, Go, Rust, Bash, Java, Lua, Haskell, x86 Assembly; HTML, CSS, Javascript
Software: Linux (Arch/Gentoo), Kubernetes, Git, Neovim, Coq, Lean, LaTeX, TLA+, Spin/Promela, IDA

Certifications

- Ham Radio General License. Callsign: KC3UTS
- Red Cross CPR/AED Certification