Richard Liu

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Experiences

Trail of Bits – *Software Engineer Intern*
Dec 2024 - Jan 2025 Remote

- Profiled and optimized pwndbg, a popular Python GDB plugin, reducing startup time by 15% and cutting load time for core functionality by 85% for thousands of users worldwide.
- Applied Python profiling tools (cProfile, line_profiler) to diagnose bottlenecks in large codebases.

Battelle Memorial Institute – *Cyber Security Intern*
May 2024 - Aug 2024 Columbus, OH

- Designed and implemented a distributed over-the-air fuzzing system, scaling fuzz testing across multiple devices and leading to 10x increase in fuzzing throughput.
- Developed Python-based fuzzing tools targeting embedded wireless stacks; reverse-engineered Bluetooth chipsets to expose internal commands for better fuzz testing integration, exposed 20% more of the bluetooth stack for testing.
- Authored detailed technical documentation and proposed mitigations, contributing to secure wireless system design.

Sandia National Labs – *R&D Software Intern*
May 2023 - Dec 2023 Albuquerque, NM

- Reverse-engineered embedded firmware with Ghidra to discover security vulnerabilities in binaries.
- Built a remote firmware debugger with Python and instruction patching, requiring a deep knowledge of the underlying firmware binary.
- Enabled colleagues to diagnose firmware more effectively, improving the lab's embedded analysis capability and decreased overall debugging time by 30%.

Projects

UIUC Apartments
Group Project

- Built a web platform with cloud infrastructure backend aggregating local housing data via custom Python scrapers, PostgreSQL backend, and GCP Cloud Functions.
- Adopted by hundreds of UIUC students to find apartments.

ZeroMQ/QEMU Integration
Research Project

- Implemented a C-based pubsub ZeroMQ device model for QEMU, enabling generic peripheral interactions.
- Improved peripheral simulation throughput by 2–10x compared to Python-GDB approaches.

Education

University of Illinois Urbana-Champaign – *M.S. in Computer Science*
Aug 2024 - May 2026 (anticipated) | GPA: 3.9/4.0 Champaign, IL

University of Illinois Urbana-Champaign – *B.S. in Mathematics & Computer Science*
Aug 2021 - May 2024 | GPA: 3.9/4.0 Champaign, IL

Technical Skills

- **Expert**: Python, C, fuzz testing, OOP, JavaScript, data processing
- **Proficient**: Assembly (x86, ARM, MIPS, RISC-V), Git, Docker, IoT, TCP/IP
- **Intermediate**: Kubernetes, Cloud infrastructure, PostgreSQL