Akshith **Gunasekaran**

Systems Security Researcher

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Summary

Systems security researcher with expertise in tool-driven defense and offensive analysis. Specializes in automated program analysis, reverse engineering, kernel hardening, and attack surface reduction. Skilled in fuzzing, dynamic instrumentation, and debugging complex systems such as the Linux kernel (x86/ARM), PKI infrastructure, and control binaries. Experience spans academic research, tooling, and competitive security (DEFCON CTF 2022 Finalist). Proven ability to build secure infrastructure and contribute to both foundational and applied security work.

Education

Oregon State University — *Corvallis, OR*

Ph.D. in Computer Science — *Sep 2017 – Sep 2025*

- Focus: Systems Security, Software Security, Program Analysis.
- Research on kernel debloating, attack surface reduction, and security test automation.
- Co-advised by: Rakesh Bobba and Yeongjin Jang.
- Activities: DEFCON CTF 2022 Finalist, DamCTF Organizer, OSU Security Club.
- GPA: 3.6 / 4.0

SRM University — *Chennai, India*

B.Tech. in Computer Science and Engineering — *2012 – 2016*

- Undergraduate research on semantic search engines for Indian languages.
- Represented university at ABU Robocon robotics competition.

Work Experience

Oregon State University — *Corvallis, OR*

Graduate Research Assistant — *2018 – 2025*

- Conducted research in systems and software security focusing on program analysis, test generation, and attack surface reduction.
- Developed tools for kernel/CA debloating and control-plane instrumentation using QEMU, LLVM, AFL, Syzkaller.
- Built dynamic analysis frameworks and automated test generation pipelines using Ghidra, GDB, libfuzzer, Docker.

SRI International (DARPA SocialCyber) — *Menlo Park, CA*

Program Analysis Research Intern — *Summer 2022*

- Developed static and graph-based techniques to detect adversarial influence in large open-source ecosystems.
- Used Tree Sitter, LLVM IR, and GNNs to analyze code/contributor behavior; presented findings to The Linux Foundation.
- Mined patch metadata to uncover socio-technical attack surfaces.

PARC Intelligent Systems Lab — *Palo Alto, CA*

Reverse Engineering Research Intern — *Summer 2021*

- Investigated neural decompilation for backdoor detection in control binaries.
- Contributed to program synthesis and re-synthesis pipelines using genetic algorithms, Ghidra, and GDB.

MIT Media Lab, Human Dynamics Group — *Boston, MA*

Collaborator — *Winter 2017*

- Explored decentralized governance models and their implications for collective decision-making in digital societies.
- Prototyped smart contract mechanisms using Solidity and web3.js to test participatory policy systems on Ethereum.
- Engaged with interdisciplinary research bridging law, technology, and social systems.

Simpl — *Bangalore, India*

Software Engineer, Founding Team — *2014 – 2017*

- Built and scaled backend infrastructure for a digital credit platform serving 10M+ users and 25K+ merchants.
- Led MVP development and secure API design; deployed systems using Golang, RoR, AWS, Spark, Cassandra.
- Focused on resilience, distributed systems, and production readiness from seed to scale.

Publications

Testing Certificate Authorities: An Empirical Analysis of CA Implementations

*ICSE 2025**

Akshith Gunasekaran, Manish Motwani, Zane Ma, Rakesh Bobba

- Presents **CAFuzz**, a state coverage-guided fuzzing framework to evaluate and improve test suite completeness in CA software.
- Provides the first comprehensive measurement study of test quality across real-world ACME implementations.
- Topics: Automated Software Testing, Program Analysis, TLS Infrastructure.

In Pursuit of Lean OS Kernels

*ACSAC 2025**

Akshith Gunasekaran, Gabriel Ritter, Rakesh Bobba

- Proposes a **trace-free, dependency-aware kernel specialization** technique that reduces kernel binary size by up to 20%.
- Provides a comparative analysis of static and dynamic kernel debloating methods using real workloads on x86/ARM.
- Topics: Operating Systems, Attack Surface Reduction, Kernel Hardening.

Balancing Image Privacy and Usability with Thumbnail-Preserving Encryption

NDSS 2019

Kimia Tajik, Akshith Gunasekaran, …, Rakesh Bobba, Mike Rosulek, Charles Wright, Wu-chi Feng

- Introduces an encryption scheme that preserves thumbnail functionality while protecting image contents.
- Demonstrates compatibility with existing cloud storage ecosystems and real-world user workflows.
- Topics: Applied Cryptography, Privacy, Cloud Security.

SENSOR: Graph-based Revision History Analysis for Code Evolution Introspection

Preprint 2023

Akshith Gunasekaran, Huascar Sanchez, Briland Hitaj

- Models code revision histories as graphs to detect semantically risky changes that may introduce vulnerabilities.
- Integrates into Linux Kernel CI/CD to flag potentially malicious or anomalous commits.
- Topics: Secure Software Supply Chain, Graph-Based Code Analysis, CI/CD Security.

A Program Synthesis Approach for Reconstructing Control Algorithms from Binaries

Preprint 2022

Ali Shokri, Alexandre Perez, …, Akshith Gunasekaran, Shantanu Rane

- Uses a combination of symbolic synthesis and neural decompilation to reverse engineer control logic from embedded binaries.
- Demonstrates its utility in understanding and vetting control software in CPS and industrial firmware.
- Topics: Program Synthesis, Reverse Engineering, Embedded Systems.

MultiK: A Framework for Orchestrating Specialized Kernels

Preprint 2019

Akshith Gunasekaran, Hsuan-Chi Kuo, Yeongjin Jang, Sibin Mohan, Rakesh Bobba, David Lie

- Presents **MultiK**, a system that enables per-context kernel specialization to reduce runtime attack surface.
- Supports orchestration of multiple concurrent specialized kernels for multi-tenant environments.
- Topics: OS Security, Kernel Isolation, Microkernel Architectures.

Activities — Security Competitions, Education, and Community Engagement

Oregon State University

2020 – 2024

CTF Team Member, OSUSEC

- DEFCON CTF 2022 Finalist (16th place), regular participant in BSidesPDX and NSA Codebreaker Challenge.
- Co-organized DamCTF, a large-scale jeopardy-style CTF competition hosted by OSUSEC.

Pacific Northwest Cyber Camp (NSA GenCyber)

2018, 2019, 2024

Instructor

- Delivered week-long hands-on training in cybersecurity for high school students.
- Topics included adversarial thinking, cryptography, ethical hacking, and security hygiene.

Top-tier Security Conferences

2019 – 2024

External Reviewer

- Served as reviewer for IEEE S&P (2022), ACM CCS (2021–2024), ASIACCS (2023–2024), IEEE DSN, RTSS, and RTAS.

Bitcoin India Meetup, Mumbai

2015

Organizer

- Hosted early community meetups on Bitcoin, cryptographic protocols, and decentralized systems.
- Facilitated discussion between developers, entrepreneurs, and technologists in the Indian crypto ecosystem.

Skills

Languages	Python, C, Rust, Go, Bash
Systems & Security	Program analysis, fuzzing, reverse engineering, kernel hardening, attack surface reduction, static/dynamic instrumentation
Tools & Frameworks	Ghidra, LLVM, QEMU, libFuzzer, AFL, Syzkaller, Tree Sitter, GDB, Docker, Git
Domains	Linux kernel (x86/ARM), PKI infrastructure, embedded systems, control binaries, software supply chain security
CTF Focus Areas	Binary exploitation (pwn), RE, symbolic execution, vulnerability triage