Akshith **Gunasekaran**

Security Researcher

Portland, OR

+1(541)745-9868 | akshith.gunas@gmail.com | akshithg.xyz | akshithg | akshithg

Summary

Software Systems and Supply Chain Security Engineer with expertise in program analysis, reverse engineering, and automated security testing. Designed tools for Linux kernel hardening, ACME/PKI fuzzing, and supply chain assurance. Proficient in fuzzing frameworks (OSS-Fuzz, libFuzzer, syzkaller, AFL), analysis tooling (LLVM, CodeQL, Ghidra, QEMU), and systems-level debugging. Experience spans Linux kernel (x86/ARM), embedded firmware, and CI/CD pipelines. DEFCON CTF 2022 Finalist.

Skills

Languages	Python, C, Go, Rust, Bash
Security Domains	Infrastructure security, supply chain security, kernel hardening, reverse engineering, software assurance
Program Analysis & Fuzzing	Static/dynamic instrumentation, symbolic execution, fuzz testing (OSS-Fuzz, LibFuzzer, AFL, Syzkaller)
Tooling	LLVM, CodeQL, QEMU, Ghidra, Tree Sitter, GDB, Docker, Git
Systems Worked On	Linux kernel (x86/ARM), PKI/ACME infrastructure, control binaries, CI/CD pipelines

Education

Oregon State University — *Corvallis, OR*

Ph.D. in Computer Science — *Sep 2018 – 2025(Expected)*

- Focus: Infrastructure and software security — specializing in kernel hardening, supply chain assurance, and automated security testing.
- Built tools for Linux kernel debloating, ACME/PKI fuzzing, and coverage-guided test analysis to improve assurance of security-critical systems.
- Co-advised by Rakesh Bobba and Yeongjin Jang on projects involving kernel security, fuzzing infrastructure, and software supply chain analysis.
- Activities: DEFCON CTF 2022 Finalist; organized DamCTF; member of OSU Security Club.

Experience

Oregon State University — *Corvallis, OR*

Cyber Security Research — *Sep 2018 – 2025*

- Designed and evaluated a kernel specialization pipeline that reduced Linux kernel size by 30% across 15 real-world workloads (x86/ARM).
- Built CAFuzz, a state-coverage-guided fuzzing tool for CA implementations (ACME), uncovering 6 new bugs in 4 real deployments.

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

Software Supply Chain Security Research Intern — *June 2022 – Dec 2022*

- Worked on DARPA SocialCyber project to protect open-source software integrity using hybrid AI and socio-technical analysis.
- Built SENSOR, a graph-based pipeline (LLVM IR + Tree-sitter + GNNs) to identify high-risk patches in Linux kernel repos with 82% precision.
- Analyzed 15K+ patches and contributor metadata to surface socio-technical attack vectors in large OSS suppl chains; presented findings to The Linux Foundation.

PARC Intelligent Systems Lab — *Palo Alto, CA*

Reverse Engineering Research Intern — *June 2021 – Dec 2021*

- Built CONSTRUCT, a reverse engineering framework for reconstructing control logic from embedded firmware using Ghidra and static analysis.
- Developed a correct-by-construction genetic algorithm that synthesized valid Modelica models for PI/PID controllers with 90%+ accuracy, outperforming baseline methods.

Simpl — *Bangalore, India*

Software Engineer, Founding Team — *Jan 2014 – Aug 2017*

- Designed and scaled backend systems for a digital credit platform serving 10M+ users and 25K+ merchants, supporting 1K+ TPS peak load.
- Led MVP development and secure API design; shipped production-ready backend using Golang, RoR, Spark, Cassandra, and AWS.
- Enabled merchant onboarding in under 48 hours via real-time analytics and scalable transaction infrastructure.

Publications

CAFuzz: A State Coverage Guided Fuzzer for CA Protocols

Under Review - ICSE 2025

Akshith Gunasekaran, Manish Motwani, Zane Ma, Rakesh Bobba

- Develops **CAFuzz**, a state coverage-guided fuzzing tool that improves test completeness for certificate authorities (CAs).
- Identifies coverage gaps in ACME implementations and reveals 6 previously untested bugs across 4 production-grade CAs.

In Pursuit of Lean OS Kernels

Under Review - ACSAC 2025

Akshith Gunasekaran, Gabriel Ritter, Rakesh Bobba

- Proposes a dependency-aware kernel specialization pipeline that reduces kernel attack surface by 20–30% without requiring runtime traces.
- Benchmarks specialization across real-world x86/ARM workloads and contrasts results with dynamic, trace-based methods.

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

Preprint 2023

Akshith Gunasekaran, Huascar Sanchez, Briland Hitaj

- Builds **SENSOR**, a graph-based pipeline to analyze commit histories and flag potentially vulnerable or malicious code changes.
- Integrates with CI/CD for the Linux kernel to surface supply chain risks in evolving codebases.

A Program Synthesis Approach for Reconstructing Control Algorithms from Binaries

Preprint 2022

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

- Combines symbolic synthesis and neural decompilation to recover control logic from embedded binaries in cyber-physical systems.
- Enables transparency, auditing, and forensic analysis of firmware controlling robots and drones.

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 image encryption scheme compatible with cloud services that preserves usability while protecting content.
- Enables secure previews (thumbnails) without decrypting full image data — balancing privacy and UX.

MultiK: A Framework for Orchestrating Specialized Kernels

Preprint 2019

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

- Proposes **MultiK**, a runtime system for per-application kernel specialization to reduce attack surface in multi-tenant environments.
- Supports concurrent specialized kernels, offering isolation and lean kernel footprints tailored to each workload.

Security Involvement

Open Source Security Contributions

2018 – Present

Contributor

- OSS-Fuzz harness for Boulder ACME server.
- SENSOR — A software supply chain security analysis tool.
- CONSTRUCT — A reverse engineering framework for control logic synthesis.

OSUSEC | DEFCON Finalist

2018 – 2024

CTF Team Member

- DEFCON CTF 2022 Finalist (16th place); frequent participant in BSidesPDX, NSA Codebreaker Challenge.
- Co-organized DamCTF — a large-scale jeopardy-style CTF competition.

Pacific Northwest Cyber Camp (NSA GenCyber)

2018, 2019, 2024

Instructor

- Taught cybersecurity to high school students; topics included adversarial thinking, cryptography, and ethical hacking.

Top-Tier Security Venues

2019 – 2025

Reviewer

- Served as reviewer for IEEE S&P, ACM CCS, ACM ICSE, ASIACCS, IEEE DSN, RTSS, and RTAS.