

Friedrich Doku

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Education

Northwestern University

PhD in Computer Science

Evanston, IL

2024–Present

University of Pittsburgh

BS in Computer Science

Pittsburgh, PA

Graduated Fall 2023

Technical Skills

Languages: Python, Java, C, Go, Assembly (ARM & x64)

Tools: GDB, Vim, Linux, Bash, TensorFlow, PyTorch, Docker, AWS, Kubernetes, Oracle Cloud, Buildroot, Yocto, Busybox, U-boot

Experience

Research: CAPIO: Safe Kernel-Bypass of Commodity Devices using Capabilities 2024–Present *Evanston, IL*

- Developed the first safe kernel bypass mechanisms for commodity network interface cards.
- Mentored students in low-level kernel development.
- Exposed hardware registers to userspace without revealing unrelated registers on the same page, resolving memory granularity issues.
- Preprint: [arXiv:2512.16957](https://arxiv.org/abs/2512.16957)

Research: TrustCheckpoints, Northwestern University 2024–Present *Evanston, IL*

- Developed first unconditional software root of trust system without secret keys or specialized hardware
- Implemented timing-based malware detection using randomized k-independent polynomial challenges
- Created ARM Cortex-A53 prototype validating 192 KB SRAM in ~10s, detecting single-instruction malware
- Preprint: "[TrustCheckpoints: Time Betrays Malware for Unconditional Software Root of Trust](#)"

Reverse Engineer, Red Balloon Security Dec 2024–July 2024 *Remote*

- Reverse engineered ARM-based embedded systems and firmware to identify security vulnerabilities
- Developed RASPUTIN, an automated robot system for reverse engineering embedded devices
- Reverse engineered electric power steering controller firmware for security analysis

Software Engineering Intern, Carnegie Robotics May 2023–July 2023 *Pittsburgh, PA*

- Developed testing software for camera sensors and automation systems on embedded platforms
- Wrote kernel-level code for ARM devices and worked with PCBs

R&D Researcher, Privacy Backplane Sep 2022–Present *University of Pittsburgh, Northwestern University, University of Michigan*

- Developed legal-technical framework for IoT data privacy control
- Designed and implemented video pipeline for ARM devices in Linux kernel

TITANS Cybersecurity R&D Intern, Sandia National Laboratories May 2022–Apr 2023 *Albuquerque, NM*

- Worked with operating system kernels and hypervisors
- Wrote kernel-level code for ARM devices

Researcher, University of Pittsburgh Sep 2020–Present *Advisors: Professors Adam Lee & Jack Lange*

- Developed secure image processing system for embedded devices with device drivers and IPC mechanisms
- Configured operating systems on Hafnium hypervisor (C)

Software Engineer Contractor, Whonix Aug 2021–Sep 2022 *Remote*

- Developed kernel module signing application for secure OS protecting user identity
- Implemented live boot mode for existing Linux distributions

Software Engineer Intern, Oracle Corporation

May 2021–Aug 2021 *Austin, TX*

- Developed secure data store for IoT using Oracle Cloud and trusted hardware (github.com/friedrich12/redsgx)
- Worked with embedded Linux, Busybox, U-boot, and Docker (C and Java)

Selected Projects

Exokernel for Embedded ARM Devices, Mutex Unlocked

Fall 2021–Present

- Developing exokernel for Raspberry Pi with device drivers and core OS components (timer, scheduler, virtual memory, heap, user-space, locking, interrupts)

Khopesh: Secure Contact Tracing System, University of Pittsburgh

Summer 2020

- Published: "[Khopesh – Contact Tracing Without Sacrificing Privacy](#)"
- Implemented privacy-preserving contact tracing with Identity Based Encryption (C/C++)

Awards

Chancellor's Undergraduate Research Fellowship, University of Pittsburgh

Nov 2020