ASMITA

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EDUCATION

PhD Candidate in Electrical & Computer Engineering
University of California, Davis — Sept 2021 - Sept 2025
Graduate student researcher : Improving embedded firmware security assessment techniques (Fuzzing).
Teaching Assistant (TA) : Embedded System Courses (EEC007 x4, EEC172 x3) - Engaging lab sessions
Research Overview : Utilizing fuzzing techniques to uncover vulnerabilities in bare-metal firmware, developing automation framework, and contributing towards improving firmware fuzzing techniques. Link

MS in Electrical & Computer Engineering
University of California, Davis — 2021-23
Relevant courses : Computer security, Hardware security, Embedded computing, Computer architecture, Machine Learning, Digital system testing, Internet of Things (IoT) (GPA: 3.95)

Bachelor of Engineering in Electronics
International Institute of Information Technology, Pune, India — 2014-18

SKILLS

Python, C, Firmware static & dynamic analysis, Fuzzing, Emulation, Firmware reverse engineering, Embedded systems, Firmware security | IoT security | Embedded security; Firmware security tools - Qemu, Unicorn, Renode, Qiling, AFL/AFL++, LibAFL, LibFuzzer, Ghidra, Radare, Binwalk, Avatar, Firmadyne, and others

WORK EXPERIENCE

Product Security Intern — AMD, USA — Summer 2024
• Perform offensive security research on AMD products. • Contribute towards the implementation of fuzzing framework.

Firmware Security Intern — NetRise, USA — Summer 2023
• Conducted research on IoT firmware fuzzing techniques, including AFL++, LibFuzzer, LibAFL, and OSS-Fuzz, while also investigating the usage of LLMs in fuzzing. • Assisted NetRise in the development of an initial test prototype to integrate firmware fuzzing into their existing framework. • Conducted comprehensive testing on 263 Busybox packages, identifying potential vulnerabilities for mitigation.

Firmware Security Intern — NetRise, USA — Summer 2022
• Research and implementation for Control Flow Graph-based static analysis and prototyped binary function similarity using Python. • Assisted NetRise in creating a Proof of Concept (PoC) for adding binary similarity identification features to their framework, enhancing the identification of third-party software components more robustly.

IoT Security Consultant — Payatu, India — Oct'19 to Sept'21
• Embedded hardware and firmware security assessments including IoT protocol, and basic side-channel & fault injection attacks.
• Conducted security assessments on diverse IoT products, including smart cameras, medical devices, access control systems, wireless modems, and ECUs. • Served as a security architect for an automotive client, integrating security into product design.
• Trainer for IoT Hacking Training — Trained approx 50-100 participants at Nullcon, CPX360 Checkpoint.
• Assisted Payatu in efficiently delivering security assessment outcomes to their clients and expand their training programs across different organizations.

PUBLICATIONS

1. **Asmita**,Y. Ollinyk, M. Scott, R. Tsang, C. Fang, H. Homayoun. "Fuzzing BusyBox: Leveraging LLM and Crash Reuse for Embedded Bug Unearthing." Usenix 2024 - Link.
2. R. Tsang, **Asmita**,D. Joseph, S. Salehi, P. Mohaptra, H. Homayoun. "FFXE: Dynamic Control Flow Graph Recovery for Embedded Firmware Binaries." Usenix 2023 - Link.
3. R. Tsang, D. Joseph, **Asmita**, S. Salehi, P. Mohaptra, H. Homayoun. "FANDEMIC: Firmware Attack Construction and Deployment on Power Management IC and Impacts on IoT Applications." NDSS 2022. - Link

PROJECTS & PARTICIPATIONS

Bare-metal Firmware Fuzzing Framework (*In progress*): Developing a framework to leverage the LibAFL fuzzer and the Renode emulator for fuzzing embedded targets.

IOSC2: IoT Firmware Security : Performed analysis on a dataset of 107 real-world firmware binaries for identifying third-party software components and corresponding CVEs. — Contributed to firmware dataset collection, automation script development, and analysis. — GitHub Link

Binary Similarity Project : Implemented machine learning algorithms to determine the similarity between binary functions. — Contributions included dataset generation, feature extraction from binary control flow graphs (CFGs), feature vectorization, and applying MLP and CNN algorithms. — GitHub Link

Google HardPwn Contest : Achieved root access on the Google Pixel watch during the challenging HardPwn contest orgainized by Google at Hardwear.io. — Link

CTFs : Top 50 in Cyber Defense Challenge organised by Target and WiCyS — Link