Rishi Ranjan

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Summary

My experience/interests lie in software and hardware fuzzing, vulnerability research and compiler theory. I have developed fuzzers for various platforms including UNIX and Windows, which have found bugs in various open and closed source softwares for which I have been credited with multiple CVEs. I have participated and won many CTFs, where I solved binary exploitation and reverse engineering challenges. My current focus is on leveraging compiler instrumentation techniques for faster and more efficient fuzzing.

Education

Virgina Tech *August 2022 - Present*
M.S. Computer Science, Advisor: Dr. Matthew Hicks

Indian Institute of Technology, Roorkee *July 2018 - May 2022*
B.Tech. Computer Science and Engineering GPA : 9.1/10

Publications

Leo Stone, **Rishi Ranjan**, Matthew Hicks and Stefan Nagy. No Linux, No Problem: Fast and Correct Windows Binary Fuzzing via Target-embedded Snapshotting - ***USENIX Security 2023***

Work Experience

Research Assistant | FoRTE Research, Virginia Tech August 2022 - Present

Advisor: Dr. Matthew Hicks

- My work focuses on systems security and novel vulnerability research techniques.
- Found **0-day bugs** in popular software like Linux Kernel's BPF library, GoPro's metadata parser and other popular open-source projects like c-blosc2 and md4c.

Security Research Intern | FoRTE Research, Virginia Tech October 2021 - February 2022

Advisor: Dr. Matthew Hicks

- Designed and implemented a state-of-the-art fuzzer for Windows.
- Found **0-day bugs** in popular open-source software such as GoPro's metadata parser, audiofile, pdf2json and jhead.
- Work published in the top security conference **USENIX Security 2023**.

Security Research Intern | HexHive, Summer@EPFL May 2021 - October 2021

Advisor: Dr. Mathias Payer

- Selected among 10,000 applicants for a research internship at École Polytechnique Fédérale de Lausanne under Dr Mathias Payer in collaboration with Huawei.
- Worked on a project for designing a stateful network protocol fuzzer, designed and implemented a new structured input generator for the fuzzer.

Student Developer @AFL++ | Google Summer of Code May 2020 - August 2020

Advisor: Dominik Maier, Heiko Eißfeldt

– Google Summer of Code is a global internship program focused on bringing student developers into open source software development.

– Designed and implemented the initial version of famous multithreaded scalable library for fuzzing called LibAFL in C. (Paper in ACM CCS 2022).

Projects

False-nine - A Compile-time memory optimisation project | Virginia Tech Github

– Implemented a compiler pass to automatically free dead memory objects on the heap.

– Reduces both the average and peak memory usage of a program significantly.

– Tech stack includes C++, LLVM and cmake.

TMTO Attack on Light weight cipher | IIT Roorkee

– TMTO Attack is a cryptanalysis method to brute-force the key of a Feistel network efficiently.

– Proposed and implemented a solution to mounting an attack on ciphers with keyspace larger than ciphertext space.

Content Management System | IMG, IIT Roorkee IITR Website

– As Chief Technical Coordinator of Information Management Group, IIT Roorkee, I designed and developed a modular Content Management System for IIT Roorkee's official website of 10,000 pages.

– The tech stack includes Scala, Django, NextJS and PostgreSQL.

Predicting Popularity of Reddit posts | IIT Roorkee

– As part of the Machine Learning course, worked with a team on designing and implementing a machine learning model for Reddit post upvote prediction.

– Implemented Sentiment Analysis for Reddit posts and GloVe embeddings calculation for the preprocessing phase and integrated with existing machine learning models.

Acheivements

CVEs credited	CVE-2023-37185, CVE-2023-37186, CVE-2023-37187, CVE-2023-37188.

Capture The Flag competitions (CTFs)

CSAW CTF 2020	Ranked **2nd** in India and **14th** globally as part of InfoSecIITR.
CISCO SecCon A&D CTF 2020	Ranked **1st** as a part of InfoSecIITR.
AISS 2020 CTF	Ranked **2nd** in India as part of team inv4sion
WhiteHat CTF 2020	Qualified for finals in Vietnam.
CSAW CTF 2019	Ranked **2nd** in India and **13th** globally as part of InfoSecIITR.

Other Awards

James Thomason Scholarship Awardee	Ranked among the top candidates selected at IIT Roorkee.
Joint Entrance Examination 2018 (Advanced)	Ranked in top 0.3 percentile with a rank of **280** among 150,000 candidates.

Relevant Technical Coursework

Graduate	Network Security, System and Software Security, Compiler Optimizations
Undergraduate	Information Security, Advanced Computer Architecture, Operating Systems, Compiler Design, Machine Learning

Skills

Languages	C, C++, Python, Scala, Javascript, Bash, x86 Assembly
Software Packages	LLVM, AFL++, LibAFL, Git, GDB, Ghidra, SymCC, pwntools, QEMU, Django, ReactJS, NextJS
Platforms/Architectures	Linux, Windows, WSL, Docker

Outreach and Professional Development

Chief Technical Coordinator, IMG IIT Roorkee *May 2021 - May 2022*
Led the team of 40 students in development and maintainence of official software and services ecosystem of IIT Roorkee.

Coordinator, InfoSecIITR *July 2019 - August 2021*
Led the CTF team InfoSecIITR to popular CTF victories and contributed toward fostering a security culture in IIT Roorkee through talks and workshops.

Mentor, Student Mentorship Program IIT Roorkee *August 2020 - May 2021*
Mentored five freshman students in Computer Science, IIT Roorkee.