Haoda Wang

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Education

Columbia University **New York, NY**
PhD, Computer Science *Aug 2022 – Present*
Advisors: Asaf Cidon and Junfeng Yang

University of Southern California **Los Angeles, CA**
BS, Computer Engineering and Computer Science *Fall 2018 – Spring 2022*
Advisor: Jelena Mirkovic
Thesis: Towards Secure and Reliable Networked Systems
Magna Cum Laude, Engineering Honors, Discovery Scholar Distinction

Experience

Research

NASA Jet Propulsion Laboratory **Pasadena, CA**
Engineering Graduate Student, Robotics and Mobility Systems *Dec 2022 – Present*
Developing software-based radiation hardening methods for commercial off-the-shelf hardware on Mars 2020
- Created a fault injection framework based on QEMU to simulate single-event effects on commodity processors
- Built a single-event effect detection benchmark for commodity SoCs on spacecraft

Columbia University **New York, NY**
Graduate Research Assistant, Computer Science Department *Aug 2022 – Present*
Working as a graduate research assistant advised by Asaf Cidon and Junfeng Yang
- Developing software-based radiation hardening methods for commercial off-the-shelf hardware on space missions
- Implementing a single-event latchup detection tool for commodity single board computers
- Built an eBPF framework to accelerate NVMe-oF requests using XRP

Sandia National Laboratories **Livermore, CA**
R&D Intern, Center for Cyber Defenders *May 2022 – Aug 2022*
Summer internship on formal methods, mentored by Samuel Pollard
- Built a pipeline to detect compiler bugs using symbolic execution and the Compcert compiler

USC Information Sciences Institute **Marina del Rey, CA**
Undergraduate Research Assistant, Networking and Cybersecurity Division *Aug 2018 – May 2022*
Worked as an undergraduate research assistant at USC-ISI, advised by Jelena Mirkovic, Luis Garcia, and Christophe Hauser
- Implemented a prototype for **SMELL-CPS**, a tool for extracting natural mathematical expressions from cyber-physical binaries
- Developed **AutoCPS**, a generalized flight software autocoder that generates datasets for semantic reverse engineering projects
- Improved the hash detection accuracy of **Harm-DoS**, a tool to automatically replace hash functions vulnerable to algorithmic complexity attacks in ELF binaries using angr
- Created the prototype for **Leader**, an adaptive in-kernel defense to detect and mitigate low-rate denial of service attacks
- Constructed **Festoon**, a software-based line-rate FPGA SmartNIC emulator, as part of my senior thesis.
- Built and tested **dns-proxy**, a mitigation tool for NXDOMAIN flood attacks against DNS servers using DPDK

Harvard University **Cambridge, MA**
Research Assistant, School of Engineering and Applied Sciences *May 2021 – Aug 2021*
NSF REU-funded summer program in datacenter networking, mentored by Minlan Yu
- Developed an intrusion detection system integrating FPGA and CPU technologies with Hyperscan and the Alveo U250 SmartNIC.

Sandia National Laboratories **Livermore, CA**
R&D Intern, Scalable Modeling and Analysis Group *May 2019 – Aug 2019*
Summer internship on high-performance computing, mentored by Craig Ulmer
- Implemented a custom kernel bypass solution for on-machine packet capture and analysis at 100Gbps speeds on commodity NICs to enhance testbed experiment analysis

Software Engineering

NASA Jet Propulsion Laboratory **Pasadena, CA**
Engineering Undergraduate Student, Robot Interfaces and Visualization Group *Jan 2020 – May 2021*
Developed simulation tools for MSL and Mars 2020, mentored by Steven Myint and Amanda Chung
- Created a bespoke fuzzer generating fully valid rover sequences that found multiple fatal bugs in Mars 2020 flight software
- Maintained CI and testing infrastructure for the **SSim** flight software and kinematics simulation software
- Enabled simulation software to run on big-endian architectures and integrated flight software modules supporting RIMFAX and IVP, increasing simulation fidelity

Teaching

University of Southern California **Los Angeles, CA**
Course Producer, Department of Electrial and Computer Engineering *Aug 2019 – Dec 2019*
Assisted students with Arduino-based labs and questions for USC's EE109 class

Awards

IEEE SafeThings Best Paper Award: 2022

DoD NDSEG Fellow: 2022

USC Computer Science Award for Outstanding Research: 2022

Goldwater Scholar: 2021

USC Presidential Scholar: 2018

National Merit Scholar: 2018

Publications

Conference Proceedings

N. Weideman, H. Wang, T. Kann, S. Zahabizadeh, W.-C. Wu, R. Tandon, C. Hauser, and J. Mirkovic, "Harmdos: Hash algorithm replacement for mitigating denial-of-service vulnerabilities in binary executables," *International Symposium on Research in Attacks, Intrusions and Defenses*, 2022.

H. Wang, C. Hauser, and L. Garcia, "Autocps: Control binary dataset generation for semantic reverse engineering," *IEEE Symposium on Security and Privacy Workshops*, 2022. **Best Paper Award**.

Technical Reports

H. Wang, G. M. Baker, J. P. Kenny, and C. D. Ulmer, "An initial investigation of the design challenges associated with reliable 100gige packet capture," Tech. Rep. SAND2019-10319, Sandia National Laboratories, 2019.

Posters

R. Tandon, H. Wang, N. Weideman, S. Arakelyan, C. Hauser, and J. Mirkovic, "Poster - leader: Low-rate denial-of-service attack defense," *NDSS Symposium*, 2019.

Skills

Languages: C, C++, Python, Bash, Verilog, Coq, JavaScript

Libraries: angr, DPDK, SPDK, LLVM, OpenMP, MPI, SciPy, Bottle, Flask

Other: Linux, Docker, Git, AWS, Jenkins