

Tingzhen Dong

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I am interested in architecture, operating systems, and cloud computing. My recent research focuses on efficient defense against speculative execution and measured boot in confidential cloud computing. I desire to bring about innovations in architecture and system disciplines.

Education

Massachusetts Institute of Technology (MIT)

Boston, U.S.

Visiting Student, CSAIL, Electrical Engineering and Computer Science (EECS)

Mar 2023 - Aug 2023

- Interned at Arch-Sec Lab
- Course attended: 6.S983 Secure Hardware Design

Southern University of Science and Technology (SUSTech)

Shenzhen, China

Undergraduate, Computer Science and Technology (CST)

Sept 2020 - Current

- GPA: 3.89/4.0, Rank: 6/221
- Student of 2020 Turing Class

Research Experiences

Arch-Sec Lab, CSAIL, EECS, MIT

Supervisor: Mengjia Yan

Mar 2023 - Aug 2023

- Led a project protecting constant-time programs against transient attacks that leak secrets.
- Relieved the hardware complexity with static and coarse granularity labels as well as hardware-software co-design.
- Designed an ahead-of-time analysis framework that automates the rearrangement of the stack layout of binary.
- **Keywords:** Computer Architecture, CPU Simulation, Speculative Execution, Binary Analysis, Gem5, Valgrind

Teecert Labs, CST, SUSTech

Supervisor: Yinqian Zhang

Sept 2021 - Current

- Led a project of designing a framework provisioning confidential virtual trusted platform modules (TPM) for virtual machines (VM) in the cloud.
- Designed an encrypted protocol for TPM commands traveling through the untrusted hypervisor.
- Adapted OVMF (UEFI for VM) for backend attestation and channel establishment.
- Developed a kernel module encapsulating raw commands from intrinsic TPM drivers into encrypted ones.
- **Keywords:** Virtualization, AMD SEV-SNP, Measured Boot, TPM Protocols and Emulators, Linux Kernel, QEMU, UEFI (OVMF)

Highlighted Course Projects

PotatoS

Operating System (CS334), Instructor: Yinqian Zhang

July 2022

- Operating system from scratch, with support of SMP, based on C++.
- Preemptive resource management: Pages and processes are held and stolen by CPUs.
- User mode: *musl libc* is integrated. System calls in POSIX semantics are proxied by the PotatoS runtime library.
- Hardware abstraction layer: PotatoS decouples hardware-level code and operating system code.
- Self-designed memory layout, memory initialization, and trap mechanism.
- Integrated Microsoft mimalloc for efficient kernel memory allocation.
- **Keywords** Operating system from scratch, SMP

Hive CPU

Computer Organization (CS214), Instructor: Jin Zhang

May 2022 - June 2022

- Asynchronous pipeline CPU on FPGA
- ISA: Mips32r6el
- Register renaming implemented.
- Dynamic overclocking implemented.
- Established compiler toolchain for C++. Snake game programmed by C++ could run on Hive.
- **Keywords:** CPU, FPGA, Asynchronous pipeline, Cross-compilation

Yet Another Address Sanitizer

Computer Security (CS315), Instructor: Fengwei Zhang

Oct 2021 - Jan 2022

- LLVM-based instrumentation plugin guaranteeing memory access sanity.
- Proposed and addressed buffer overflow cases that cannot be detected by existing solutions such as *ASan*.
- Light-weight implementation based on pointer arithmetic checking and tagged pointers.
- **Keywords:** Compilers, LLVM Pass, Buffer overflow detection, Pointer tagging

AlphaReversi Zero

Artificial Intelligence (CS311), Instructor: Bo Yuan

July 2022

- Reinforcement learning AI for Reversed-Reversi, imitating AlphaGo Zero.
- Self-implemented neural network and training. No dependency on machine learning frameworks such as PyTorch.
- Accelerated self-play simulation using self-implemented distributed computing.
- **Keywords:** Artificial Intelligence, AlphaGo Zero, Neural Network, Distributed computing

Extracurricular Experiences

SUSTech Collegiate Programming Team

Leader

Jan 2021 - Dec 2021

- 7 years of experience in Olympiad in Informatics (OI) + 2 years of experience in Collegiate Programming Contest (ICPC)
- Organized routine training, maintained disciplines, and promoted team culture construction.

The 4th Southern University of Science and Technology Collegiate Programming Contest

Shenzhen, China

Director

Dec 2021

- Polished online judge's front end and back end for amenity.
- Configured, deployed, and maintained online judge's server and judgehost cluster.
- Composed questions for the contest.
- Designed the contest schedule.
- More than 250 students in SUSTech attended the contest. More than 200 teams from Chinese colleges attended the contest online.
- The contest received official sponsorship from a local IT company.

6.S983 - Secure Hardware Design, MIT

Boston, U.S.

Lab Tester

Mar 2023 - May 2023

- Tested Rowhammer lab, ASLR Bypassing lab, and CPU fuzzing lab before they were published.
- Provided difficulty estimations and document improvement suggestions.
- Discovered bugs in the fancy CPU when it was adapted for the fuzzing lab.

CS208 - Algorithm Design and Analysis, SUSTech

Shenzhen, China

Student Assistant

Feb 2022 - June 2022, Sept 2022 - Jan 2023

- Piloted the composition of 50 programming questions for the course's 13 labs.
- Communicated with the teaching assistant and students to tune the teaching pace.

CS203 - Data Structures and Algorithm Analysis, SUSTech

Shenzhen, China

Student Assistant

Sept 2022 - Jan 2023, Sept 2023 - Current

- Composed 7 lab questions about balanced binary search tree in 2022 fall.
- Hosted lab tutorials mentoring 40 students in 2023 fall.

CS303 - Artificial Intelligence, SUSTech

Shenzhen, China

Student Assistant

Sept 2022 - Jan 2023

- Lab Q&A
- Instructed and deployed course projects.

Anki-Android

Contributor

Apr 2022 - May 2022

- Added support for hierarchy tag (*PR #10966*).
- Eulogized by several maintainers for quick responses and good coding style.

Achievements

Nov 2022	2nd Place , IndySCC22 Student Cluster Competition	Online
Apr 2022	Gold Medal 7/166 , The 2021 International Collegiate Programming Contest Asia Macau Regional Contest	Online
Nov 2021	Gold Medal 22/682 , The 2021 International Collegiate Programming Contest Asia Shanghai Regional Contest	Online
May 2021	Silver Medal 7/49 , The 2020 International Collegiate Programming Contest Asia Macau Regional Contest	Macau, China
Apr 2021	Gold Medal 13/294 , The 2020 International Collegiate Programming Contest Asia-East Continent Final	Xi'an, China
Dec 2020	Gold Medal 19/677 , The 2020 International Collegiate Programming Contest Asia Shanghai Regional Contest	Online
Nov 2020	Gold Medal 12/324 , The 2020 China Collegiate Programming Contest Changchun Regional Contest	Online

Skills

Programming

C/C++, Java, Python

Miscellaneous

Vim (good proficiency, 8 years of experience), Shell, Git

Sports

Skilled in tennis, swimming, middle and long-distance running