

Sishuai Gong

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Department of Computer Science

Purdue University

- EDUCATION** **Purdue University**, West Lafayette, IN, U.S.A August 2019 - Present
Ph.D Student in Computer Science
Advisor: [Pedro Fonseca](#)
- University of Science and Technology of China**, Hefei, China September 2015 - June 2019
Bachelor in Computer Science
- RESEARCH INTERESTS** I am broadly interested in operating system research. My recent research focuses on improving the efficiency, safety and reliability of real-world kernels, with particular interests in kernel performance (e.g., memory management) and kernel testing (e.g., concurrency testing, fuzzing).
- PUBLICATIONS** **Snowcat: Efficient Kernel Concurrency Testing using a Learned Coverage Predictor**
Sishuai Gong, Dinglan Peng, Deniz Altınbüken, Pedro Fonseca, Petros Maniatis
In [Proceedings of the 29th ACM Symposium on Operating Systems Principles \(SOSP\)](#), Germany, 2023; Acceptance rate: 18%
- KIT: Testing OS-level Virtualization for Functional Interference Bugs**
Congyu Liu, **Sishuai Gong**, Pedro Fonseca
In [Proceedings of the 28th International Conference on Architectural Support for Programming Languages and Operating Systems \(ASPLOS\)](#), 2023; Acceptance rate: 17%
- Snowboard: Finding Kernel Concurrency Bugs through Systematic Inter-thread Communication Analysis**
Sishuai Gong, Deniz Altınbüken, Pedro Fonseca, Petros Maniatis
In [Proceedings of the 28th ACM Symposium on Operating Systems Principles \(SOSP\)](#), Virtual, 2021; Acceptance rate: 15%
- On-Demand-Fork: A Microsecond Fork for Memory-Intensive and Latency-Sensitive Applications**
Kaiyang Zhao, **Sishuai Gong**, Pedro Fonseca
In [Proceedings of the 16th European Conference on Computer Systems \(EuroSys\)](#), Virtual, 2021; Acceptance rate: 21%
- InspectorGadget: A Framework for Inferring TCP Congestion Control Algorithms and Protocol Configurations**
Sishuai Gong, Usama Naseer, Theophilus Benson
In [Proceedings of the IFIP Network Traffic Measurement and Analysis Conference \(TMA\)](#), Virtual, 2020; Acceptance rate: 33.3%
- SELECTED RESEARCH** **Security Monitor for Confidential VMs** May 2022 - July 2022
Designed a new architecture of confidential VMs based on AMD SEV-SNP technology, where a security monitor runs along with the guest OS in the VM but at a higher

privilege level. The security monitor provides vital security features such as runtime measurement and attestation to the guest OS and enables efficient VM and hypervisor communications.

Machine-learning-guided Kernel Concurrency Testing August 2021 - Present
Designed effective representations of large-scale software systems that enable machine learning models to effectively learn multi-threaded executions of kernel test inputs and make predictions on execution coverage for newly generated inputs. Integrating the model into modern kernel testing workflows to prioritize interesting test inputs, thus improving testing efficiency.

Kernel Concurrency Test Input Generation January 2020 - May 2021
Developed an approach to analyzing thread communication in the kernel and generating kernel concurrent test inputs to test communications under concurrent execution. This work helped discover several new concurrency bugs in the Linux kernel, some of which had serious impact on users (e.g., causing kernel panics) and had existed for years. Worked with developers to fix discovered bugs.

A Fast Implementation of the fork() System Call January 2020 - April 2021
Designed a new design of fork() that extends copy-on-write approach to page table management, thus reducing system call invocation latency and improving process execution efficiency. Evaluated the implementation on a wide-range of applications including AFL, SQLite, and Redis

Large-scale TCP Congestion Control Census August 2018 - October 2018
Designed a framework to fingerprint and identify TCP congestion control algorithm deployment on public web servers. The measurement results on Alexa Top 5K sites enable reasoning about the current dynamics of the internet with respect to performance, fairness, and protocol equilibrium.

**WORK
EXPERIENCE**

Microsoft Research, Redmond/Remote, WA, U.S.A
Research Intern, mentored by Ziqiao Zhou and Weidong Cui May 2022 - July 2022

Purdue University, West Lafayette, IN, U.S.A
Research Assistant, advised by Pedro Fonseca September 2020 - Present

Purdue University, West Lafayette, IN, U.S.A
Teaching Assistant, CS240: Programming in C Summer 2020
Teaching Assistant, CS180: Foundations of Computer Science Fall 2019

Brown University, Providence, RI, U.S.A
Research Intern, advised by Theophilus Benson August 2018 - October 2018

**AWARDS AND
MEMBERSHIPS**

Purdue's nominee for the Google Ph.D. Fellowship, 2021
Purdue's nominee for the Microsoft Ph.D. Fellowship, 2021
Outstanding Bachelor Thesis Award by USTC (Top ~3%), 2019
Merit Student Scholarship honored by USTC, 2017 & 2018
Freshmen Scholarship honored by USTC, 2015

SKILLS

C, Python, Linux Kernel, Kernel concurrency testing, Software testing