Ali Hajiabadi

Computer Science PhD Candidate
National University of Singapore (NUS)

Contact Information

Address: 13 Computing Drive, Singapore, 117417, SoC @ NUS
Email: ali.hajiabadi@u.nus.edu
Homepage: hajiabadi.github.io

Research Interests

Systems Security, Hardware/Software Co-design, Computer Architecture, Optimizing Compilers, Secure Architectures and Software, Microarchitectural Attacks, Machine Learning Security and Privacy

Education

Aug. 2019 - Present
Doctor of Philosophy in Computer Science
National University of Singapore (NUS), Singapore
Thesis: *"Non-speculative and Non-deterministic Processing for Efficient and Secure Modern CPUs"*
Advisor: Dr. Trevor E. Carlson

2014 - 2019
Bachelor of Science in Computer Engineering
Sharif University of Technology, Tehran, Iran
Thesis: *"High Concurrency Latency Tolerant Register Files for GPUs"*
Advisor: Prof. Hamid Sarbazi-Azad

2009 - 2013
Diploma in Physics and Mathematics Discipline
Shahid Beheshti High School, Birjand, Iran
Affiliated with the National Organization for the Development of Exceptional Talents (NODET)

Honors & Awards

Jan. 2022 Recipient of Student Travel Award from ASPLOS'22 conference.
Aug. 2021 Recipient of Research Achievement Award from School of Computing, NUS.
Mar. 2020 Invited talk and travel grant for the 2^{nd} Young Architect Workshop at ASPLOS'20, Switzerland.
Feb. 2019 Recipient of President's Graduate Fellowship, the most prestigious doctoral fellowship at National University of Singapore (NUS).
Sep. 2014 Ranked **164**th in Iranian National University Entrance Exam among more than 250,000 students.
2006/2009 Recognized as talented student in entry exam of NODET for middle school and high school.

Research Experience

Aug. 2019 - Present
Graduate Research Assistant at National University of Singapore, Singapore
NUS Computer Architecture Group
Advisor: Prof. Trevor E. Carlson
My current research spans around HW/SW co-design to build secure and efficient general-purpose processors. My focus is on microarchitectural attacks, including speculation-based attacks and power analysis attacks.

Jul. 2016 - Jun. 2019
Research Assistant at Sharif University of Technology, Tehran, Iran
High Performance Computer Architectures and Networks (HPCAN) Lab
Advisor: Prof. Hamid Sarbazi-Azad
Focus of my research has been on latency tolerant register files for GPUs through HW/SW cooperative register prefetching. I contributed to an ASPLOS'18 paper and an ACM TOCS paper. In collaboration with *Institute for Research in Fundamental Sciences*, *EPFL*, and *ETH Zürich*.

Summer 2018
Research Intern at National University of Singapore, Singapore
Advisor: Prof. Trevor E. Carlson
As a visiting research assistant, I investigated the potentials of out-of-order commit in modern processors and explored implementations (simulation+compiler) to enable out-of-order commit.

Peer-Reviewed Publications

ICCAD'23 | Arash Pashrashid, **Ali Hajiabadi**, Trevor E. Carlson
HidFix: *Efficient Mitigation of Cache-based Spectre Attacks through Hidden Rollbacks*.
To appear in Proceedings of 42^{nd} IEEE/ACM International Conference on Computer-Aided Design (ICCAD 2023), November 2023. Acceptance rate: 172/768 = 22.4%

ICCAD'22 | Arash Pashrashid, **Ali Hajiabadi**, Trevor E. Carlson
Fast, Robust and Accurate Detection of Cache-based Spectre Attack Phases.
Proceedings of 41^{st} IEEE/ACM International Conference on Computer-Aided Design (ICCAD 2022), November 2022. Acceptance rate: 132/586 = 22.5%
Paper | Github Project

ASPLOS'21 | **Ali Hajiabadi**, Andreas Diavastos, Trevor E. Carlson
Noreba: *A Compiler-Informed Non-speculative Out-of-Order Commit Processor*.
Proceedings of 26^{th} ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 2021). April 2021. Acceptance rate: 75/398 = 18.8%
Paper | Extended Abstract | Short Slides | Short Talk | Slides | Full Talk

TOCS'21 | Mohammad Sadrosadati, Amirhossein Mirhosseini, **Ali Hajiabadi**, Seyed Borna Ehsani, Hajar Falahati, Hamid Sarbazi-Azad, Mario Drumond, Babak Falsafi, Rachata Ausavarungnirun, Onur Mutlu
Highly Concurrent Latency-tolerant Register Files for GPUs.
In ACM Transactions on Computer Systems (TOCS), 2021.
arXiv Paper

CGO'21 | Harish Patil, Alexander Isaev, Wim Heirman, Alen Sabu, **Ali Hajiabadi**, Trevor E. Carlson
ELFies: Executable Region Checkpoints for Performance Analysis and Simulation.
Proceedings of 19^{th} IEEE International Symposium on Code Generation and Optimization (CGO 2021), March 2021. Acceptance rate: 31/89 = 34.8%
Paper

In-Progress Work

Ali Hajiabadi, Archit Agarwal, Andreas Diavastos, Trevor E. Carlson
Mitigating Speculation-based Attacks through Configurable Hardware/Software Co-design.
arXiv Paper, 2023

Yun Chen, **Ali Hajiabadi**, Lingfeng Pei, Trevor E. Carlson
New Cross-Core Cache-Agnostic and Prefetcher-based Side-Channels and Covert-Channels.
arXiv Paper, 2023

Yun Chen*, **Ali Hajiabadi***, Romain Poussier, Andreas Diavastos, Shivam Bhasin, Trevor E. Carlson
Mitigating Power Attacks through Fine-Grained Instruction Reordering.
*Authors with equal contribution.
arXiv Paper, 2021

Teaching Experience

➢ **National University of Singapore, Singapore**

Spring 2020 and Spring 2021 — **Teaching Assistant**, Tutorial Instructor
Course: CS2106 Introduction to Operating Systems
Instructor: Prof. Djordje Jevdjic

➢ **Sharif University of Technology, Tehran, Iran**

Spring 2017 — **Teaching Assistant**, Assignments/Projects Assistant
Course: CE323 Computer Architecture
Instructor: Prof. Hamid Sarbazi-Azad

Fall 2017 and Fall 2018 — **Teaching Assistant**, Tutorial Instructor, Assignments/Projects Assistant
Course: CE453 Real-Time Systems
Instructor: Prof. Amirhossein Jahangir

Services

Oct. 2022	**Shadow PC member** at 18^{th} European Conference on Computer Systems (EuroSys 2023), Rome.
Mar. 2022	**Mentor in the Meet-a-Senior-Student program** at 27^{th} International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 2022), Lausanne.
Jun. 2021	**Student Volunteer** at 42^{nd} International Conference on Programming Language Design and Implementation (PLDI 2021), Virtual.

Research Mentoring

2021 - Present	Arash Pashrashid, PhD Student Advised by Trevor E. Carlson
2020 - Present	Yun Chen, PhD Student Advised by Trevor E. Carlson
2021 - 2023	Archit Agarwal, Research Assistant at NUS
2020 - 2021	Vernon Pang, Undergraduate Student at NUS

Talks

Aug. 2021	Noreba: **A Compiler-Informed Non-speculative Out-of-Order Commit Processor** *Computing Research Week, School of Computing (NUS)*, Virtual.
Apr. 2021	Noreba: **A Compiler-Informed Non-speculative Out-of-Order Commit Processor** *International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 2021)*, Virtual.
Feb. 2021	**Accelerating HPC applications with Out-of-Order Commit Processors** *Free and Open source Software Developers' European Meeting (FOSDEM 2021), HPC, Big Data, and Data Science track*, Virtual.
Mar. 2020	**Speculation-Free Out-of-Order Commit** *2^{nd} Young Architect Workshop at the 25^{th} International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 2020)*, Virtual.

Skills

Programming Languages:	C, C++, Python, bash, and familiar with Java, Matlab, Scala
Instruction Set Architectures:	x86, ARM, RISC-V
Scientific Tools:	LLVM Compiler Infrastructure, gem5 Simulator, Sniper Simulator, Intel Pin, DynamoRIO
Operating Systems:	Linux, Mac OS, Windows
Typesetting:	LaTeX, Microsoft Word