

# Seyed Armin Vakil Ghahani

 Computer Science & Engineering Department, University Park, PA 16802



## EDUCATION

**Pennsylvania State University**, University Park, PA

Aug 2018 – Now

- Ph.D. Student in Computer Science & Engineering Department
  - Advisor: Prof. Mahmut Taylan Kandemir
  - GPA: 4/4
  - **Relevant Graduate Courses:** Fundamentals of Computer Architecture, Algorithm Design and Analysis, Binary-level Analysis, Language-based Security, Operating System Design, Emerging Technologies, Compiler Construction

**Sharif University Of Technology**, Tehran, Iran

Sep 2013 – Jul 2018

- Bachelor of Science (B.S.) in Computer Engineering - Hardware
  - Thesis: Cache Replacement Policy Based on Expected Hit Count  
Advisor: Prof. Hamid Sarbazi-Azad
  - GPA: 16.47/20 (**CE Major Coursework: 18.1/20**)

## RESEARCH INTERESTS

- Computer Architecture
- Memory Systems
- Virtual Memory
- Virtualized Systems
- Persistent Memory

## PUBLICATIONS

- Sara Mahdizadeh Shahri, **Armin Vakil**, Aasheesh Kolli “(Almost) Fence-less Persist Ordering”, *In Proceedings of the 53rd Annual IEEE/ACM International Symposium on Microarchitecture, (MICRO 2020)*
- **Armin Vakil**, Mahmut Taylan Kandemir, Jagadish Kotra “DSM: A Case for Hardware-Assisted Merging of DRAM Rows with Same Content”, *In Proceedings of the ACM on Measurement and Analysis of Computing Systems, (SIGMETRICS 2020)*
- Mohammad Bakhshalipour, Aydin Faraji, **Armin Vakil**, Farid Samandi, Pejman Lotfi-Kamran, Hamid Sarbazi-Azad “Reducing Writebacks Through In-Cache Displacement”, *ACM Transactions on Design Automation of Electronic Systems, (TODAES 2019)*
- **Armin Vakil**, Sara Mahdizadeh Shahri, Mohammad Bakhshalipour, Pejman Lotfi-Kamran, Hamid Sarbazi-Azad “Making Belady-Inspired Replacement Policies More Effective Using Expected Hit Count.” *arXiv preprint, (arXiv 2018)*
- **Armin Vakil**, Sara Mahdizadeh Shahri, Mohammad-Reza Lotfi-Namin, Mohammad Bakhshalipour, Pejman Lotfi-Kamran, Hamid Sarbazi-Azad, “Cache Replacement Policy Based on Expected Hit Count”, *IEEE Computer Architecture Letters, (CAL 2017)*

## RESEARCH EXPERIENCE

- **Pennsylvania State University**
  - ◇ **DRAM Memory** - DRAM memories need refresh operations because they lose their content/charge over time. The overhead of these refreshes increases with larger DRAM memories. My research in this area reduces the memory refresh overhead in virtualized systems by leveraging the same-content values in DRAM.
  - ◇ **Virtual Memory** - Huge pages reduce the virtual-to-physical address translation by reducing the pressure on TLB and increasing the TLB reach. However, allocating huge pages in presence of memory fragmentation has high overheads and I try to address this problem in my research.
  - ◇ **Persistent Memory** - Exploring persistent memory programming challenges and opportunities.
- **Sharif University of Technology**
  - ◇ **Cache Replacement Policies** - My B.Sc. thesis project is on predicting the correlation of reuse-distance between cache blocks and remaining hit count of each cache block. In our research, we proposed a cache replacement policy that leverages the correlation between reuse-distance and the remaining hit count.

<b>WORK EXPERIENCE</b>	▪ Software Developer, <b>I-Cliqq</b>	Jan 2018 – Aug 2018
	• Designing Embroidery Software	
	▪ Software Developer, <b>Viratech Sharif</b> , Tehran, Iran	Sep 2015 – Sep 2016
	• Traffic Simulator (C++) - Network Simulator	
	• Add tunneling protocol between link, internet, and transport layer	
<b>TEACHING EXPERIENCE</b>	▪ Teaching Assistant at Pennsylvania State University	
	• Introduction to Computer Architecture (CMPEN 431)	Spring 2020
	• Computer Organization and Design (CMPEN 331)	Fall 2018, 2019, Spring 2019
	▪ Teaching Assistant at Sharif University of Technology	
	• Computer Architecture	Fall 2016, 2017
	• Digital System Design	Spring & Fall 2017
	• Digital Design	Spring 2017
	• Advanced Logic Design	Fall 2016
	• Discrete Structures	Spring 2016
	• Advanced Programming	Fall 2014, 2015
	• Fundamental Of Programming	Spring & Fall 2014
	▪ High School Teacher	2013 – 2018
	• Teaching Combinatorics, Graph Theory, Algorithm, and C++ Programming	
<b>NOTABLE PROJECTS</b>	<b>Graduate Projects:</b>	
	▪ <b>Loop Analysis</b> (Compiler Construction)	May 2020
	• Loop properties analysis based on LLVM	
	▪ <b>Parallel Distributed File System</b> (Operating System Design)	Dec 2019
	• Based on gRPC and Google Protobuf	
	▪ <b>Binary Instrumentation</b> (Binary-Level Program Analysis)	May 2019
	• Instrumentation for DLLs during runtime of applications for providing persistency guarantees	
	▪ <b>Efficient Undo Logging Implementation</b> (Fundamentals of Computer Architecture)	Dec 2018
	• Rethinking undo logging state-of-the-art design for efficiently updating undo-logging metadata	
	<b>Undergraduate Projects:</b>	
	▪ <b>Domain-Specific Language for Financial Calculations</b> (Compiler Design)	Jan 2018
	• Implementing a DSL for Financial Contracts based on ANTLR and C++	
	▪ <b>Hospital Management System</b> (Real-time Systems)	Jan 2017
	• Patient's condition monitoring scheduler	
	▪ <b>Chat</b> (Computer Networks)	May 2016
	• Server-Client Chat system over TCP network based on C++ and Qt	
	▪ <b>Linux Development</b> (Operating System)	Mar 2016 – Jul 2016
	• Implementing a system call to provide the MAC address of network interfaces to the user space	
	• Adding proc files to provide details, number of occurred interrupts, enable/disable, and show number of sk_buff data structures for each network interface	
	▪ <b>Trax Game</b> (FPGA National Contest)	Apr 2016
	• Two player game based on Verilog	
	▪ <b>NoC</b> (Digital System Design)	Jan 2016
	• 3D Mesh Network on Chip based on Verilog	
	▪ <b>Judge</b>	Mar 2015
	• Designing and implementing a judge system for evaluating codes	
	▪ <b>Plants vs Zombies</b> (Advanced Programming - C++)	Jul 2014
	• Based on Qt Creator	
	▪ <b>Sudoku</b> (Introduction to Programming)	Jan 2014
	• Graphical Sudoku game based on GTK	
	▪ <b>Billiard</b> (Introduction to Programming)	Jan 2014
	• Graphical Billiard game based on GTK	
<b>HONORS AND AWARDS</b>	▪ Qualified for 2nd Cache Replacement Championship (CRC-2)	
	• Cache Replacement Policy Based on Expected Hit Count	Jun 2017
	▪ Undergraduate grant from the Iranian National Elites Foundation	Sep 2012 – Jan 2015
	▪ <b>Silver Medal</b> in 22nd Iran National Olympiad in Informatics(INOI)	Sep 2012

<b>COMMUNITY SERVICE</b>	▪ <b>Sharif AI Challenge</b> (Contest Organizer)	Jan 2015 – Jan 2017
	• Undergraduate Programming Contest	
	▪ <b>1st Gateuino Contest</b> (Contest Organizer)	May 2016
	• Founded a new hardware contest for undergraduate freshman and sophomore	
<b>PRESENTATIONS</b>	▪ DSM: A Case for Hardware-Assisted Merging of DRAM Rows with Same Content	
	• ACM SIGMETRICS	June 2020
<b>SKILLS</b>	▪ Programming Languages: C/C++, Python, Verilog, R, Shell, Assembly ▪ Simulators: gem5, BadgerTrap, DRAMsim2, BigHouse, Ramulator, CACTI, SimpleSSD, ChampSim ▪ Tools & Frameworks: Qemu, Pin, DynamoRIO, LLVM, ANTLR, Google Protobuf, gRPC, Qt ▪ Operating Systems: Ubuntu(Native), Windows ▪ Type Setting: L <sup>A</sup> T <sub>E</sub> X, Microsoft Office	
<b>LANGUAGES</b>	▪ Persian: Native ▪ English: Fluent	