

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.

WORK EXPERIENCE	<ul style="list-style-type: none"> ▪ Software Developer, I-Cliqq Jan 2018 – Aug 2018 <ul style="list-style-type: none"> • Designing Embroidery Software ▪ Software Developer, Viratech Sharif, Tehran, Iran Sep 2015 – Sep 2016 <ul style="list-style-type: none"> • Traffic Simulator (C++) - Network Simulator • Add tunneling protocol between link, internet, and transport layer
TEACHING EXPERIENCE	<ul style="list-style-type: none"> ▪ Teaching Assistant at Pennsylvania State University <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Teaching Combinatorics, Graph Theory, Algorithm, and C++ Programming
NOTABLE PROJECTS	<p>Graduate Projects:</p> <ul style="list-style-type: none"> ▪ Loop Analysis (Compiler Construction) May 2020 <ul style="list-style-type: none"> • Loop properties analysis based on LLVM ▪ Parallel Distributed File System (Operating System Design) Dec 2019 <ul style="list-style-type: none"> • Based on gRPC and Google Protobuf ▪ Binary Instrumentation (Binary-Level Program Analysis) May 2019 <ul style="list-style-type: none"> • Instrumentation for DLLs during runtime of applications for providing persistency guarantees ▪ Efficient Undo Logging Implementation (Fundamentals of Computer Architecture) Dec 2018 <ul style="list-style-type: none"> • Rethinking undo logging state-of-the-art design for efficiently updating undo-logging metadata <p>Undergraduate Projects:</p> <ul style="list-style-type: none"> ▪ Domain-Specific Language for Financial Calculations (Compiler Design) Jan 2018 <ul style="list-style-type: none"> • Implementing a DSL for Financial Contracts based on ANTLR and C++ ▪ Hospital Management System (Real-time Systems) Jan 2017 <ul style="list-style-type: none"> • Patient's condition monitoring scheduler ▪ Chat (Computer Networks) May 2016 <ul style="list-style-type: none"> • Server-Client Chat system over TCP network based on C++ and Qt ▪ Linux Development (Operating System) Mar 2016 – Jul 2016 <ul style="list-style-type: none"> • 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 ▪ Trax Game (FPGA National Contest) Apr 2016 <ul style="list-style-type: none"> • Two player game based on Verilog ▪ NoC (Digital System Design) Jan 2016 <ul style="list-style-type: none"> • 3D Mesh Network on Chip based on Verilog ▪ Judge Mar 2015 <ul style="list-style-type: none"> • Designing and implementing a judge system for evaluating codes ▪ Plants vs Zombies (Advanced Programming - C++) Jul 2014 <ul style="list-style-type: none"> • Based on Qt Creator ▪ Sudoku (Introduction to Programming) Jan 2014 <ul style="list-style-type: none"> • Graphical Sudoku game based on GTK ▪ Billiard (Introduction to Programming) Jan 2014 <ul style="list-style-type: none"> • Graphical Billiard game based on GTK
HONORS AND AWARDS	<ul style="list-style-type: none"> ▪ Qualified for 2nd Cache Replacement Championship (CRC-2) <ul style="list-style-type: none"> • Cache Replacement Policy Based on Expected Hit Count Jun 2017 ▪ Undergraduate grant from the Iranian National Elites Foundation Sep 2012 – Jan 2015 ▪ Silver Medal in 22nd Iran National Olympiad in Informatics(INOI) Sep 2012

COMMUNITY SERVICE	▪ Sharif AI Challenge (Contest Organizer)	Jan 2015 – Jan 2017
	• Undergraduate Programming Contest	
	▪ 1st Gateuino Contest (Contest Organizer)	May 2016
	• Founded a new hardware contest for undergraduate freshman and sophomore	
PRESENTATIONS	▪ DSM: A Case for Hardware-Assisted Merging of DRAM Rows with Same Content	
	• ACM SIGMETRICS	June 2020
SKILLS	▪ 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: \LaTeX , Microsoft Office	
LANGUAGES	▪ Persian: Native ▪ English: Fluent	