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

- **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)**

WORK EXPERIENCE

- Software Developer, **I-Cliqq** — Jan 2018 – Aug 2018
  - Designing Embroidery Software
- Software Developer, **Viratech Sharif**, Tehran, Iran — Sep 2015 – Sep 2016
  - Traffic Simulator (C++) - Network Simulator
  - Add tunneling protocol between link, internet, and transport layer

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 presense 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.

TEACHING EXPERIENCE

- 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

NOTABLE PROJECTS

Graduate Projects:

- **Loop Analysis** (Compiler Construction) — May 2020
  - Loop properties analysis based on LLVM
- **Parallel Distributed File System** (Operating System Design) — Dec 2019
  - Based on gRPC and Google Protobuf
- **Binary Instrumentation** (Binary-Level Program Analysis) — May 2019
  - Instrumentation for DLLs during runtime of applications for providing persistency guarantees
- **Efficient Undo Logging Implementation** (Fundamentals of Computer Architecture) — Dec 2018
  - Rethinking undo logging state-of-the-art design for efficiently updating undo-logging metadata

Undergraduate Projects:

- **Domain-Specific Language for Financial Calculations** (Compiler Design) — Jan 2018
  - Implementing a DSL for Financial Contracts based on ANTLR and C++
- **Hospital Management System** (Real-time Systems) — Jan 2017
  - Patient's condition monitoring scheduler
- **Chat** (Computer Networks) — May 2016
  - Server-Client Chat system over TCP network based on C++ and Qt
- **Linux Development** (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 occured interrupts, enable/disable, and show number of sk_buff data structures for each network interface
- **Trax Game** (FPGA National Contest) — Apr 2016
  - Two player game based on Verilog
- **NoC** (Digital System Design) — Jan 2016
  - 3D Mesh Network on Chip based on Verilog
- **Judge** — Mar 2015
  - Designing and implementing a judge system for evaluating codes
- **Plants vs Zombies** (Advanced Programming - C++) — Jul 2014
  - Based on Qt Creator
- **Suduko** (Introduction to Programming) — Jan 2014
  - Graphical Suduko game based on GTK
- **Billiard** (Introduction to Programming) — Jan 2014
  - Graphical Billiard game based on GTK

HONORS AND AWARDS

- 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
- **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