

# Eiman Ebrahimi

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## MAIN INTERESTS

My background and interests are primarily in computer system architecture, especially in the cooperation of hardware with system-software, the runtime system, and the compiler to improve many-core system performance, energy-efficiency, and quality of service.

I am also interested in problems related to design and performance analysis of big-data systems and exa-scale computing platforms.

## EDUCATION

**The University of Texas at Austin — Ph.D., Dec 2011**

Supervisor: Yale N. Patt

**The University of Texas at Austin — MSc., May 2007**

GPA: 3.97 / 4.0

**University of Tehran, BSc., May 2005**

GPA: 16.9 / 20

## WORK EXPERIENCE

**Senior Research Scientist, NVIDIA, Austin USA Sep 2014 - Present**

**Main Projects:** Selective GPU Caches to Eliminate CPU-GPU Coherence: designed several architectural improvements to offset performance penalty of selective caching. These optimizations bring a selective caching GPU to within 4% of a fully cache coherent implementation without the need to integrate CPUs and GPUs under a single coherence protocol.

Transparent Offloading and Mapping (TOM) - Enabling Programmer-Transparent Near-Data Processing in GPU Systems: designed an offload candidate selection mechanism that can be implemented as a static compiler pass that balances the bandwidth costs and benefits of offloading. Also designed a reactive data mapping mechanism that remaps pages across the stacks to increase the stack-level locality of the offloaded computation and its data.

**Computer Architect, NVIDIA, Austin USA - Apr 2012 - Sep 2014**

**Main roles:** High-performance and Quality-of-Service aware memory controllers for Tegra SoCs.

I contributed to the development and correlation of a highly accurate memory controller/memory system simulator for NVIDIA's Tegra SoCs.

Owned the design and implementation of the API used by multiple teams (software and SoC design teams), that sets up the Tegra memory controller for quality-of-service guarantees and performance. Worked on NVIDIA discrete GPU memory controllers at NVIDIA. My contribution there was the evaluation and design of address mapping policies across the entire memory system. Address mapping is a heavily optimized part of NVIDIA's designs targeted at distributing memory requests between multiple similar resources at each level of the memory system hierarchy.

### **Postdoctoral Researcher, The University of Texas at Austin --- Dec 2011 - Apr 2012**

Researching management of shared resources for high performance, quality of service, and energy efficiency in big-data systems.

I was also involved in mentoring a couple of PhD students, helping them track and make continuous progress on milestones towards their thesis.

### **Research Intern, IBM Austin Research Lab, Austin USA — May 2010 - Aug 2010**

Researching high-performance and fair memory subsystems for multi-core systems.

### **Research Intern, Microsoft Research, Redmond USA — May 2008 - Aug 2008**

Researching techniques for bandwidth-efficient prefetching of linked data structures in hybrid prefetching systems. The results of this research were later published in the HPCA 2009 paper listed in the Publications section below.

### **Senior Design Engineer, PA Semi. Santa Clara USA— May 2007 - Aug 2007**

Performance evaluation/analysis, identifying performance bottlenecks.

## **TALKS**

- International Conference on High-Performance Computer Architecture, 2016. Title: Selective GPU Caches to Eliminate CPU-GPU Coherence.
- ECE NYU Faculty Candidate Talk, 2014. Title: Rethinking Computer Architectures in the Age of Big-Data.
- ECE Illinois Faculty Candidate Talk, 2012. Title: Fair and High Performance Shared Resource Memory Resource Management for Chip Multiprocessors.
- International Symposium on Computer Architecture, 2011. Title: Prefetch-Aware Shared-Resource Management for Multi-Core Systems.
- IBM Research, Austin, 2011. Title: Managing memory system inter-thread interference.
- International Conference on Architectural Support for Programming Languages and Operating Systems, 2010. Title: Fairness via Source Throttling: A Configurable and High-Performance Fairness Substrate for Multi-Core Memory Systems
- International Symposium on Microarchitecture, 2009. Title: Coordinated Control of Multiple Prefetchers in Multi-Core Systems.
- International Conference on High-Performance Computer Architecture, 2009. Title: Techniques for Bandwidth-Efficient Prefetching of Linked Data Structures in Hybrid Prefetching Systems.

## **PUBLICATIONS**

Kevin Hsieh, [Eiman Ebrahimi](#), Gwangsun Kim, Niladrish Chatterjee, Mike O’Conner, Nandita Vijaykumar, Onur Mutlu, and Stephen W. Keckler, “**Transparent Offloading and Mapping (TOM): Enabling Programmer-Transparent Near-Data Processing in GPU Systems,**” *to appear in the 43rd International Symposium on Computer Architecture (ISCA-43)*, Seoul, June 2016.

Milad Hashemi, Khubaib, [Eiman Ebrahimi](#), Onur Mutlu, and Yale N. Patt, "Accelerating Dependent Cache Misses with an Enhanced Memory Controller," *to appear in the 43rd International Symposium on Computer Architecture (ISCA-43)*, Seoul, June 2016.

Neha Agarwal, David Nellans, [Eiman Ebrahimi](#), Thomas F. Wenisch, John Danskin, and Stephen W. Keckler, "**Selective GPU Caches to Eliminate CPU-GPU Hardware Cache Coherence,**" *The 22nd International Symposium on High-Performance Computer Architecture (HPCA)*, Barcelona, March 2016.

Mark Stephenson, Siva Kumar Sastry Hari, Yunsup Lee, [Eiman Ebrahimi](#), Daniel R. Johnson, David Nellans, Mike O'Connor, and Stephen W. Keckler, “**Flexible Software Profiling of GPU Architectures,**” *The 42nd International Symposium on Computer Architecture (ISCA-42)*, Portland, June 2015.

Rustam Miftakhutdinov, [Eiman Ebrahimi](#), Yale N. Patt, “**Predicting Performance Impact of DVFS for Realistic Memory Systems,**” *The 45th Annual IEEE/ACM International Symposium on Microarchitecture (MICRO-45)*, Vancouver, December 2012.

Marco A. Z. Alves, Khubaib, [Eiman Ebrahimi](#), Veynu T. Narasiman, Carlos Villavicija, Phillipe O. A. Navaux, and Yale N. Patt, “**Energy Savings via Dead Sub-Block Prediction,**” *The 24th International Symposium on Computer Architecture and High Performance Computing (SBAC-PAD)*, New York, October 2012.

[Eiman Ebrahimi](#), Chang Joo Lee, Onur Mutlu, and Yale N. Patt, “**Fairness via Source Throttling: A Configurable and High-Performance Fairness Substrate for Multi-Core Memory Systems,**” *ACM Transactions on Computer Systems (TOCS)*, April 2012.

[Eiman Ebrahimi](#), Rustam Miftakhutdinov, Chris Fallin, Chang Joo Lee, Jose A. Joao, Onur Mutlu, and Yale N. Patt, “**Parallel Application Memory Scheduling,**” *The 44th Annual IEEE/ACM International Symposium on Microarchitecture (MICRO-44)*, Porto Alegre, December 2011.  
*Acceptance Rate: 21%*

[Eiman Ebrahimi](#), Chang Joo Lee, Onur Mutlu, and Yale N. Patt, “**Prefetch-Aware Shared Resource Management for Multi-Core Systems,**” *The 38th International Symposium on Computer Architecture (ISCA-38)*, San Jose, June 2011.  
*Acceptance Rate: 19.2%*

[Eiman Ebrahimi](#), Chang Joo Lee, Onur Mutlu, and Yale N. Patt, “**Fairness via Source Throttling: A Configurable and High-Performance Fairness Substrate for Multi-Core Memory Systems,**” *The 15th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS-15)*, Pittsburgh, March 2010.  
**Best Paper Award.**  
**Acceptance Rate: 17.7%**

[Eiman Ebrahimi](#), Onur Mutlu, Chang Joo Lee, and Yale N. Patt, “**Coordinated Control of Multiple Prefetchers in Multi-Core Systems,**” *The 42nd Annual IEEE/ACM International Symposium on Microarchitecture (MICRO-42)*, New York, December 2009.  
*Acceptance Rate: 24.8%*

[Eiman Ebrahimi](#), Onur Mutlu, Yale N. Patt, “**Techniques for Bandwidth-Efficient Prefetching of Linked Data Structures in Hybrid Prefetching Systems,**” *The 15th International Symposium on High-Performance Computer Architecture (HPCA-15)*, Raleigh, February 2009.  
**One of three papers nominated for Best Paper Award by the Program Committee.**  
**Acceptance Rate: 19%**

Hadi Esmailzadeh, Amir Moghimi, [Eiman Ebrahimi](#), Caro Lucas, Zainalabedin Navabi, Sied Mehdi Fakhraie, “**DCim++: a C++ library for object-oriented hardware design and distributed Simulation,**” *IEEE International Symposium on Circuits and Systems (ISCAS)*, Island of Kos, Greece, 2006.

Hadi Esmaeilzadeh, Neda Shahidi, [Eiman Ebrahimi](#), Amir Moghimi, Caro Lucas, Zainalabedin Navabi, “**Cim++: A C++ Library for Object Oriented Hardware Design,**” *International Journal of Science and Information Technology (IJIST) Lecture Notes of 1st International Conference on Informatics, vol. 1, no. 2, pp. 35-41*, September 2004.

## TECHNICAL REPORTS

Chang Joo Lee, [Eiman Ebrahimi](#), Veynu Narasiman, Onur Mutlu, and Yale N. Patt, “**DRAM-Aware Last-Level Cache Replacement**,” *HPS Technical Report*, TR-HPS-2010-007, December 2010.

[Eiman Ebrahimi](#), Chang Joo Lee, Onur Mutlu, and Yale N. Patt, “**Prefetch-Aware Shared Resource Management for Multi-Core Systems**,” *HPS Technical Report*, TR-HPS-2010-005, December 2010.

Chang Joo Lee, Veynu Narasiman, [Eiman Ebrahimi](#), Onur Mutlu, and Yale N. Patt, “**DRAM-Aware Last-Level Cache Writeback: Reducing Write-Caused Interference in Memory Systems**,” *HPS Technical Report*, TR-HPS-2010-002, April 2010.

[Eiman Ebrahimi](#), Onur Mutlu, Yale N. Patt, “**Techniques for Bandwidth-Efficient Prefetching of Linked Data Structures in Hybrid Prefetching Systems**,” *HPS Technical Report*, TR-HPS-2008-004, October 2008.

## ACADEMIC RESEARCH EXPERIENCE

**Research Assistant, The University of Texas at Austin, HPS Research Group — Sep 2007 - Dec 2011**

Investigating high-performance and fair memory system designs for CMP systems.  
High-performance and bandwidth efficient prefetching for CMP systems.  
Bandwidth-efficient prefetching techniques for linked data structures in hybrid prefetching systems.

**Research Assistant, The University of Texas at Austin, EDGE Group — May 2006 - Aug 2006**

Investigating scratchpad memories for modern dataflow processors.

**Research Assistant, University of Tehran, VLSI Group — Apr 2004 - Jul 2005**

Design and implementation of a distributed simulation environment for the Cim++ hardware description language.

## TEACHING EXPERIENCE

**Teaching Assistant, The University of Texas at Austin — Jan 2010 - May 2010**

Microarchitecture, EE382N. Responsible for conducting discussion sessions and overseeing students’ term project of microarchitecture design and implementation for a subset of the x86 ISA.

**Teaching Assistant, The University of Texas at Austin — Sep 2008 - Jan 2009**

Introduction to Computing, EE306. Responsible for conducting discussion sessions and designing lab/homework assignments. This role involved managing 9 other TAs in a 400 person class where I was the head TA of the course.

**Teaching Assistant, The University of Texas at Austin — Sep 2005 - May 2007**

Mixed Signal Laboratory, EE321K. Responsible for conducting lab sessions.

**Teaching Assistant, University of Tehran, VLSI Group — Sep 2004 - May 2005**

Digital Electronics. Responsible for conducting discussion sessions and grading.  
VLSI 1. Responsible for conducting discussion sessions and grading.

## SKILLS

**Programming:** C/C++, Java, C#, Verilog, MPI, Python

**Tools:** vTune, Oprofile, Pin, Cadence (Verilog-XL, Virtuoso, Spectre), Synopsys (VCS/Virsim, DesignVision)

**Employability Status:** U.S. Permanent Resident