



# Jason Mars

## Curriculum Vitae

### Research Interests

**Cross-layer systems architectures** in both software and hardware, **datacenter and warehouse-scale computer architecture**, and **hardware / software co-design** focused on native application performance, energy efficiency, and system utilization, particularly in the context of the latest innovations in microarchitectural design, runtime systems, and cloud computing.

### Current Position

2013–Present **Assistant Professor**, *The University of Michigan*, Ann Arbor, Department of Electrical Engineering and Computer Science (EECS).

### Prior Faculty Appointments

2012–2013 **Assistant Professor**, *The University of California*, San Diego, Department of Computer Science and Engineering (CSE).  
*Peggy and Peter Preuss Faculty Scholar*

### Education

- 2006–2012 **Ph.D. in Computer Science**, *The University of Virginia*, Charlottesville, Virginia.
  - Dissertation: *Rethinking the Architecture of Warehouse-Scale Computers*
- 2006–2008 **M.S. in Computer Science**, *The University of Virginia*, Charlottesville, Virginia.
  - Thesis: *General Pattern Based Prediction For Online Optimizations and Runtime Adaptation*
- 2001–2005 **B.S. in Computer Science**, *The University of Pittsburgh*, Pittsburgh, Pennsylvania.

### Honors and Awards

- 2012 **Preuss Faculty Scholar Appointment** (\$125k Endowment)
- 2012 **UVA Research Award** (\$400 Cash Prize)
- 2012 **Best Paper Award** Code Generation and Optimization (CGO '12)
- 2012 **Best Paper from Computer Architecture Letters** Presented at HPCA '12
- 2011 **Work Selected as IEEE MICRO Top Picks** IEEE MICRO '12
- 2011 **Work Selected as Spotlight Feature by Editorial Board** IEEE CAL '11
- 2011 **Excellent Papers of the Year Recognition** Google's Official Research Blog
- 2011 **Google PhD Fellowship for Compiler Technology** Funding for 3 years / \$105k

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2010	<b>Best Presentation Award</b>	Code Generation and Optimization (CGO '10)
2007	<b>Ford Pre-Doctoral Fellowship</b>	Funding for 3 years / \$60k
2007	<b>UNCF Scholarship</b>	\$5k

## Prior Appointments

- Summer 2013 **Visiting Scientist**, *Google*, Mountain View, California.
- Investigated opportunities to improve efficiency of Google's backend infrastructure and arrived at 4 promising results.
  - Published - Usenix ATC 2014*
- Summer 2012 **Research Scholar**, *Intel Labs*, Santa Clara, California.
- Designed and prototyped a hw/sw co-designed hybrid approach to unit level power gating.
  - Improvements in energy efficiency of over 20% compared to state of the art techniques.
- Summer 2011 **Research Intern**, *Intel Labs*, Santa Clara, California.
- Designed and prototyped adaptive extension to hw/sw co-designed processors to achieve more efficient hardware atomicity.
  - Can improve performance (IPC) by 1.4x over current state-of-the-art solutions.
  - Published - ISCA 2012*
- Spring 2011 **Research Intern**, *Google*, Mountain View, California.
- Designed and prototyped Bubble-Up, an approach to enable "safe" co-locations and ultimately improve utilization in warehouse scale computers.
  - Precisely predicts the QoS impact of cross-core interference between co-running jobs with ~1% error.
  - Published - MICRO 2011, IEEE MICRO Top Picks 2012*
- Summer 2010 **Research Intern**, *Google*, Mountain View, California.
- Designed and prototyped a runtime approach to exploit the platform heterogeneity in current datacenters.
  - Improved datacenter efficiency by up to 16% on real production datacenter workloads.
  - Published - CAL 2011, ISCA 2013*
- Summer 2009 **Research Intern**, *Google*, Mountain View, California.
- Designed and prototyped contention aware runtime environment to detect and respond to contention due to co-scheduling.
  - Utilization improvements of up to 30% on select benchmarks.
  - Published - CGO 2010*
- Summer 2008 **Research Intern**, *Google*, Mountain View, California.
- Designed and prototyped compiler technology to dynamically apply aggressive optimizations.
  - Performance improvement of up to 12% on select benchmarks.
  - Published - CGO 2009*

## Impact and Press

- June 2013 **MIT News**, "*Managing multicore memory*"
- <http://web.mit.edu/newsoffice/2013/managing-multicore-memory-0913.html>
  - Technical interview of colleague's work.
- June 2013 **The Register**, "*Google boasts of app tuning prowess on 'warehouse scale clusters*"
- [http://www.theregister.co.uk/2013/06/10/google\\_boasts\\_of\\_app\\_tuning\\_prowess\\_on\\_warehouse\\_scale\\_clusters/](http://www.theregister.co.uk/2013/06/10/google_boasts_of_app_tuning_prowess_on_warehouse_scale_clusters/)
  - HPCA 2013 paper featured.

May 2013 **Wired Magazine**, “*Why Even Google Will Embrace Cellphone Chips in the Data Center*”

- <http://www.wired.com/wiredenterprise/2013/05/google-jason-mars/>
- ISCA 2013 (Whare-Map) paper featured, and interview.
- Also covered in ACM Tech News

May 2013 **Wired Magazine**, “*The Real Reason ARM Will Menace Intel in the Data Center*”

- <http://www.wired.com/wiredenterprise/2013/05/hp-arm-memcached-chip-paper/>
- Quoted

Nov. 2012 **SBO in Production GCC 4.8**

- <http://gcc.gnu.org/wiki/FunctionMultiVersioning>
- CGO 2009 technique (SBO) adapted and integrated into mainline GCC 4.8

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## Referred Publications

### Book Chapters

Book Chapter **Jason Mars, Lingjia Tang**. Understanding Application Contentiousness and Sensitivity on Modern Multicores. *Advances in Computers Vol. 91, 2013*

### Conference and Journal Papers

MICRO 2014 **Michael Laurenzano, Yunqi Zhang, Soundarajan Balaji, Lingjia Tang, Jason Mars**. Protean Code: Achieving Near-Free Online Code Transformations for Warehouse Scale Computers. *In Proceedings of The 47th Annual IEEE/ACM International Symposium on Microarchitecture (MICRO) 2014*

- Acceptance Rate: 19%

MICRO 2014 **Yunqi Zhang, Michael Laurenzano, Jason Mars, and Lingjia Tang**. SMiTe: Precise QoS Prediction on Real System SMT Processors to Improve Utilization in Warehouse Scale Computers *In Proceedings of The 47th Annual IEEE/ACM International Symposium on Microarchitecture (MICRO) 2014*

- Acceptance Rate: 19%

USENIX ATC 2014 **Yan Zhai, Xiao Zhang, Stephane Eranian, Lingjia Tang, and Jason Mars**. HaPPy: Hyperthread-aware Power Profiling Dynamically. *In Proceedings of the 2014 USENIX Conference on Annual Technical Conference (USENIX ATC) 2014*

- Acceptance Rate: 15%

Scientific Programming 2014 **Alex Breslow, Ananta Tiwari, Martin Schulz, Laura Carrington, Lingjia Tang and Jason Mars**. Enabling fair pricing on high performance computer systems with node sharing. *Journal of Scientific Programming 2014*

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- SC 2013 Alex Breslow, Ananta Tiwari, Laura Carrington, Lingjia Tang and Jason Mars. Enabling Fair Pricing on HPC Systems with Node Sharing. *In proceedings of the International Conference on High Performance Computing, Networking, Storage and Analysis (SC) 2013*
- Acceptance Rate: 20%
  - **Nominated for Best Paper!**
- ISCA 2013 Jason Mars, Lingjia Tang. Heterogeneity in ?Homogeneous? Warehouse-Scale Computers. *In proceedings of the 40th annual International Symposium on Computer Architecture (ISCA) 2013*
- Acceptance Rate: 19%
  - **Featured in Wired Magazine Article!**
    - <http://www.wired.com/wiredenterprise/2013/05/google-jason-mars/>
- ISCA 2013 Hailong Yang, Alex Breslow, Jason Mars, Lingjia Tang. Bubble-PiPo: Precise Online QoS Management for Increased Utilization in Warehouse Scale Computers. *In proceedings of the 40th annual International Symposium on Computer Architecture (ISCA) 2013*
- Acceptance Rate: 19%
- ASPLOS 2013 Lingjia Tang, Jason Mars, Wei Wang, Tanima Dey, Mary Lou Soffa. ReQoS: Reactive Static/Dynamic Compilation for QoS in Warehouse Scale Computers. *In proceedings of the 18th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS) 2013*
- Acceptance Rate: 23%
- HPCA 2013 Lingjia Tang, Jason Mars, Xiao Zhang, Robert Hagmann, Robert Hundt, Eric Tune. Optimizing Google?s Warehouse Scale Computers: The NUMA Experience. *In proceedings of the 19th IEEE International Symposium on High-Performance Computer Architecture (HPCA) 2013*
- ISCA 2012 Jason Mars, Naveen Kumar. BlockChop: Dynamic Squash Elimination for Hybrid Processor Architecture. *In proceedings of the 39th annual International Symposium on Computer Architecture (ISCA) 2012*
- Acceptance Rate: 17%
- IEEE MICRO Top Picks 2012 Jason Mars, Lingjia Tang, Robert Hundt, Kevin Skadron, Mary Lou Soffa. Increasing Utilization in Warehouse Scale Computers Using Bubble-Up! *IEEE Micro, 2012*
- Top Picks Acceptance Rate: 15%
- CGO 2012 Lingjia Tang, Jason Mars, Mary Lou Soffa. Compiling For Niceness: Mitigating Contention for QoS in Warehouse Scale Computers. *In proceedings of the ACM/IEEE International Symposium on Code Generation and Optimization (CGO) 2012*
- Acceptance Rate: 24%
  - **Best Paper Award!**

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- ISSTA 2012 Kristen Walcott-Justice, Jason Mars, Mary Lou Soffa. THeME: A System for Testing by Hardware Monitoring Events. *In proceedings of the 21st International Symposium on Software Testing and Analysis (ISSTA) 2012*
- Acceptance Rate: 28%
- ISPASS 2012 Wei Wang, Tanima Dey, Jason Mars, Lingjia Tang, Jack Davidson, Mary Lou Soffa. Performance Analysis of Thread Mappings with a Holistic View of the Hardware Resources. *In proceedings of the International Symposium on Performance Analysis of Systems and Software (ISPASS) 2012*
- MICRO 2011 Jason Mars, Lingjia Tang, Robert Hundt, Kevin Skadron, Mary Lou Soffa. Bubble-Up: Increasing Utilization in Modern Warehouse Scale Computers via Sensible Co-locations. *In Proceedings of The 44th Annual IEEE/ACM International Symposium on Microarchitecture (MICRO) 2011*
- Acceptance Rate: 21%
  - Selected as IEEE MICRO Top Picks from 2011!
- ISCA 2011 Lingjia Tang, Jason Mars, Neil Vachharajani, Robert Hundt, Mary Lou Soffa. The Impact of Memory Subsystem Resource Sharing on Datacenter Applications. *In proceedings of the 38th annual International Symposium on Computer Architecture (ISCA) 2011*
- Acceptance Rate: 19%
  - Recognized as one of the Excellent Papers from 2011 by Google
- IEEE CAL 2011 Jason Mars, Lingjia Tang, Robert Hundt. Heterogeneity in ?Homogeneous? Warehouse-Scale Computers: A Performance Opportunity. *IEEE Computer Architecture Letters 2011*
- Acceptance Rate: 24%
  - Selected as the spotlight feature by the editorial board!
  - HPCA 2012 “Best Papers from Computer Architecture Letters!”
- TACO 2011 Jason D. Hiser, Daniel Williams, Wei Hu, Jack W. Davidson, Jason Mars, Bruce R. Childers. Evaluating Indirect Branch Handling Mechanisms in Software Dynamic Translation Systems. *ACM Transactions on Architecture and Compiler Optimization (TACO) 2011*
- ICSE 2011 Mary Lou Soffa, Kristen Walcott, Jason Mars. Exploiting Hardware Advances for Software Testing and Debugging. *In proceedings of the 33rd ACM/IEEE International Conference on Software Engineering (ICSE) 2011*
- NIER Track - Acceptance Rate: 23%
- HiPEAC 2011 Jason Mars, Lingjia Tang, Mary Lou Soffa. Directly Characterizing Cross Core Interference Through Contention Synthesis. *In proceedings of the International Conference on High Performance Embedded Architectures and Compilers (HiPEAC) 2011*
- Acceptance Rate: 23%

- CGO 2010 Jason Mars, Neil Vachharajani, Robert Hundt, Mary Lou Soffa. Contention Aware Execution: Online Contention Detection and Response. *In proceedings of the ACM/IEEE International Symposium on Code Generation and Optimization (CGO) 2010*
- Best Presentation Award
  - Excellent Paper of the Year Recognition by Google
- CGO 2009 Jason Mars, Robert Hundt. Scenario Based Optimization: A Framework for Statically Enabling Online Optimizations. *In proceedings of the ACM/IEEE International Symposium on Code Generation and Optimization (CGO) 2009*
- Integrated in Production GCC 4.8!
  - <http://gcc.gnu.org/wiki/FunctionMultiVersioning>
- MEMOCODE 2009 Daniel Williams, Aprotim Sanyal, Dan Upton, Jason Mars, Sudeep Ghosh, Kim Hazelwood. A Cross-Layer Approach to Heterogeneity and Reliability. *In proceedings of the ACM/IEEE International Conference on Formal Methods and Models for Co-Design (MEMOCODE) 2009*
- CGO 2007 Jason D. Hiser, Daniel Williams, Wei Hu, Jack W. Davidson, Jason Mars, Bruce R. Childers. Evaluating Indirect Branch Handling Mechanisms in Software Dynamic Translation Systems. *In proceedings of the ACM/IEEE International Symposium on Code Generation and Optimization (CGO) 2007*

### Workshops and Short Papers

- EXADAPT 2011 Jason Mars, Mary Lou Soffa. Loaf: A Framework and Infrastructure for Creating Online Adaptive Solutions. *ACM SIGPLAN 1st International Workshop on Adaptive Self-Tuning Computing Systems for the Exaflop Era (EXADAPT) @ PLDI 2011*
- EXADAPT 2011 Lingjia Tang, Jason Mars, Mary Lou Soffa. Contentiousness vs. Sensitivity: Improving Contention Aware Runtime Systems on Multicore Architectures *ACM SIGPLAN 1st International Workshop on Adaptive Self-Tuning Computing Systems for the Exaflop Era (EXADAPT) @ PLDI 2011*
- WBIA 2009 Jason Mars, Mary Lou Soffa. Synthesizing Contention. *In proceedings of the Workshop on Binary Instrumentation and Applications (WBIA) @ MICRO 2009*
- SHCMP 2008 Jason Mars, Daniel Williams, Dan Upton, Sudeep Ghosh, Kim Hazelwood. A Reactive Unobtrusive Prefetcher for Multicore and Manycore Architectures. *In proceedings of the Workshop on Software and Hardware Challenges of Manycore Platforms (SHCMP) @ ISCA 2008*
- CGO 2008 Jason Mars, Mary Lou Soffa. MATS: Multicore Adaptive Trace Selection. *In proceedings of the Third Workshop on Software Tools for MultiCore Systems (STMCS) @ CGO 2008*

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### Funding Awards and Support

2014 – 2017 **co-PI**, NSF XPS:FULL:CCA:1438996 , \$850,000.

Scalable Approximate Computing for Data Parallel Applications  
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- 2013 – 2016 **co-PI**, NSF CCF/SHF:Medium:1302682 , \$750,000.  
 Bridging the Software / Hardware Gap Towards Efficient, Heterogeneous, and Predictable Data-centers
- 2013 **PI**, NSF CCF:1342915 , \$14,000.  
 Student Travel Support for the 2013 IEEE International Symposium on Workload Characterization (IISWC-2013)
- 2013 **PI**, Google Research Grant, \$51,500.  
 Cluster-level and Node-level Management for Efficiency and Predictability in Datacenters
- 2012 **PI**, Google Research Grant, \$70,000.  
 A Performance Aware re-Design of Modern Cloud Platforms

## Patents Granted

- 2013 **Scenario Based Optimization**, United States Patent 8578355.
- Date Granted: 11/05/2013
  - Inventors: Jason Mars, Robert Hundt
  - Assignee: Google Inc.
  - Academic Publication - CGO 2009

## Professional Activities and Service

### Program Chair

- 2015 International Symposium on Code Generation and Optimization (CGO)

### Editorial Board

- 2012–Present ACM SIGMICRO (Special Interest Group for Computer Microarchitecture)
- Online Editor

### Program Committee

- HPCA 2015 IEEE International Symposium On High Performance Computer Architecture (HPCA)
- ISPASS 2015 IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS)
- CGO 2014 ACM/IEEE International Symposium on Code Generation and Optimization (CGO)
- IISWC 2014 IEEE International Symposium on Workload Characterization (IISWC)
- ICS 2014 ACM International Conference on Supercomputing (ICS)
- ICPP 2014 ACM International Conference on Parallel Processing (ICPP)
- MICRO 2013 ACM/IEEE International Symposium on Microarchitecture (MICRO)
- PACT 2013 ACM International Conference on Parallel Arch. and Compilation Techniques (PACT)
- CGO 2013 ACM/IEEE International Symposium on Code Generation and Optimization (CGO)
- SRC 2013 Student Research Competition (SRC)

### Referee

- Journals ACM Comp. Srv. 2014, TOPC 2014, TACO 2014, ACM Comp. Srv. 2013, TOCS 2013, CAL 2013, TACO 2012, IJPEDES 2011
- External Reviewer MICRO 2014, ISCA 2013, HPCA 2013, PACT 2012, HPCA 2012, CGO 2011, PLDI 2010

## Conference and Workshop Organization

- 2014 IEEE International Symposium On High Performance Computer Architecture (HPCA)
  - Website Chair
  
- 2014 ACM/IEEE International Symposium on Microarchitecture (MICRO)
  - Workshops/Tutorials Chair
  
- 2014 IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS)
  - Workshops Chair
  
- 2013 IEEE International Symposium on Workload Characterization (IISWC)
  - Student Travel Grants Chair
  
- 2012 IEEE International Symposium on Workload Characterization (IISWC)
  - Local Arrangements Chair
  
- 2012 ACM/IEEE International Symposium on Code Generation and Optimization (CGO)
  - Website Chair
  
- 2012 The 2nd International Workshop on Adaptive Self-Tuning Computing Systems for the Exaflop Era (EXADAPT)
  - Organizer
  
- 2011 The ACM SIGPLAN 1st International Workshop on Adaptive Self-Tuning Computing Systems for the Exaflop Era (EXADAPT)
  - Organizer

## Other

- 2012 Invited Participation at NSF CSA Workshop
  - Working group on a community supported computer architecture design and evaluation framework.

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## Invited Talks and Panels

### Keynote Talks

- 2013 **Improving the Efficiency of Multicores in Datacenters** *SICS Multicore Day 2013*

### Talks

- 2013 **Exploiting Diversity in Warehouse Scale Computers** *Hot Topics in Par. Comp. @ UDelaware*
- 2012 **Re-architecting Warehouse Scale Computers: The Utilization Story** *UC Riverside*
- 2012 **Cloud Platforms: Rethinking Their Design** *Cloud Computing Think Tank (at Gordon Center)*
- 2011 **Attacking Rigidity and Cross-layer Oblivion in the Cloud** *Standord University*
- 2011 **Jumping in to Multicore Research** *CRA-W Multicore Workshop @ ASPLOS 2011*

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- 2010 **Online Adaptation for Datacenter Efficiency** *IBM T.J. Watson Labs (Arch. Highlights Series)*  
 2010 **Introduction of Peter Norvig** *Google Inc.*

## Panels

- 2013 **Faculty Mentoring Panel** *The IDEA Center's JUMP Program at UCSD*  
 2012 **Cloud Computing Think Tank Panel** *Jacobs School of Engineering (Gordon Center)*

## Diversity Activities

- 2014 Participated in Connecting Inner-City High School Students in Detroit to the University of Michigan MiBytes Program  
 2013 Served as a Member of Executive Diversity Advisory Board for the School of Engineering  
 2013 Worked to Improve Diversity Among Faculty in STEM as a Member of JSOE Hiring Committee  
 2012 Mentor of the UCSD Inclusion Diversity Excellence and Advancement (IDEA) scholars  
 2011 Invited talk at the CRA-W Workshop for Women on Multicore Systems  
 2009 Organizer of Google Disadvantaged and Underrepresented Teen Outreach Program

## Teaching

- Fall 2014 **EECS 370: Introduction to Computer Organization** *400 Students*  
*Evals Coming Soon*  
 Winter 2014 **EECS 370: Introduction to Computer Organization** *350 Students*  
*Excellent Professor Rating: 93% (4.65/5)*  
 Fall 2013 **EECS 598: Sepcial Topics: Future Architecture** *5 Students*  
*Excellent Professor Rating: 100% (5/5)*  
 Spring 2013 **CSE 249A: Seminar on Future Cloud Platforms** *12 Students*  
*Evals Not Applicable*  
 Winter 2013 **CSE 141: Intro. to Computer Architecture** *91 Students*  
*Eval (Recommend Professor): 92%*  
 Winter 2013 **CSE 141L: Intro. to Computer Architecture Laboratory** *77 Students*  
*Eval (Recommend Professor): 90%*