

Maryam Mehri Dehnavi

CONTACT INFORMATION	Postdoctoral Researcher Computer Science and Artificial Intelligence Laboratory Massachusetts Institute of Technology <i>Citizenship:</i> Canada	<i>Mobile:</i> +1-617-301-2008 <i>E-mail:</i> mmehri@mit.edu http://people.csail.mit.edu/mmehri/
RESEARCH INTERESTS AND VISION	High-performance computing, computational science, parallel programming models, algorithms, high-performance analytics, numerical analysis, computer graphics, matrix computations. My research aims to significantly improve the performance of large-scale compute- and data-intensive problems on parallel heterogeneous architectures.	
ACADEMIC APPOINTMENTS	Massachusetts Institute of Technology , Computer Science Postdoctoral Researcher Adviser: Professor Charles E. Leiserson Feb. 2013 to present	
	University of California Berkeley , Computer Science Visiting Research Scholar Adviser: Professor James Demmel Oct. 2011 Apr. 2012	
	University of California Irvine , Computer Engineering Visiting Research Scholar Adviser: Professor Jean-luc Gaudiot Jan. 2011 to Apr. 2011	
EDUCATION	McGill University , Montreal, Canada Ph.D., Electrical and Computer Engineering (GPA: 4.0/4.0) Adviser: Professor Dennis Giannacopoulos Thesis Topic: <i>Krylov subspace methods on Graphic Processing Units</i> 2008 to 2012	
	University of Calgary , Calgary, Canada M.Sc., Computer Engineering (GPA: 4.0/4.0) Adviser: Professor Wessam M. Hassanien Thesis Topic: <i>Characterizing and enhancing SMT clustered architectures</i> 2005 to 2007	
	Isfahan University of Technology , Isfahan, Iran B.Sc., Electrical Engineering (GPA: 17.14/20) Final Project: <i>Carbon nanotubes and nanoelectronic devices</i> 2001 to 2005	
HONORS, AWARDS AND GRANTS	FQRNT postdoctoral fellowship, \$70,000, 2013-2015. NSERC (<i>Natural Sciences and Engineering Research Council of Canada</i>) Postdoctoral Fellowship, \$80,000, 2013-2015. NSERC Graduate Scholarship-CGSD, \$105,000, 2009-2012. NSERC Michael Smith Foreign Study Supplement, \$6,000, U.C. Berkeley, 2012. NSERC Industrial Research Fellowship, \$60,000, 2012. Visiting Fellowship in Canadian Government Labs, 2012. ICPP 2014 and McGill Visiting Researcher (non-conference) 2011 Travel Grants. FQRNT International Internship Scholarship, \$14,470, U.C. Irvine, 2011. Best paper finalist, <i>CEFC (IEEE Conference on computational electromagnetics)</i> , 2009.	

PAPERS IN
PREPARATION

- [1] E. Palamadi, C. Leiserson, and M. Mehri Dehnavi. Autotuning stencil computations.
- [2] M. Mehri Dehnavi, J. Demmel, and D. Fernández. Sparse approximate inverse preconditioned communication-avoiding BiCGStab solver.

REFEREED
JOURNAL
PUBLICATIONS

- [3] Y. El-Kurdi*, M. Mehri Dehnavi*, W. Gross, and D. Giannacopoulos. Parallel finite element method formulation using inference on probabilistic graphical models. *Submitted to IEEE Transactions on Parallel and Distributed Systems (TPDS)*, 2014. (* equal contribution)
- [4] Y. You, H. Fu, S. Song, M. Mehri Dehnavi, L. Gan, X. Huang, and G. Yang. Evaluating multi-core and many-core architectures through accelerating the three-dimensional Lax Wendroff correction stencil. *International Journal of High Performance Computing Applications (IJHPCA)*, 2014.
- [5] M.B. Qureshi, M. Mehri Dehnavi, et. al. Survey on grid resource allocation mechanisms. *Journal of Grid Computing (JGC)*, 1–43, 2014.
- [6] M. Mehri Dehnavi, D. Fernández, J.L. Guadiot, and D. Giannacopoulos. Parallel sparse approximate inverse preconditioning on graphic processing units. *IEEE Transactions on Parallel and Distributed Systems (TPDS)*, 24(9):1852–1862, 2013.
- [7] M. Mehri Dehnavi, Y. El-Kurdi, J. Demmel, and D. Giannacopoulos. Communication-avoiding Krylov techniques on graphic processing units. *IEEE Transactions on Magnetics (TMAG)*, 49(5):1749–1752, 2013.
- [8] D. Fernández, M. Mehri Dehnavi, W. Gross, and D. Giannacopoulos. Alternate parallel processing approach for FEM. *IEEE Transactions on Magnetics (TMAG)*, 48(2):399–402, 2012.
- [9] M. Mehri Dehnavi, D. Fernández, and D. Giannacopoulos. Enhancing the performance of conjugate gradient solvers on graphic processing units. *IEEE Transactions on Magnetics (TMAG)*, 47(5):1162–1165, 2011.
- [10] M. Mehri Dehnavi, D. Fernández, and D. Giannacopoulos. Finite-element sparse matrix vector multiplication on graphic processing units. *IEEE Transactions on Magnetics (TMAG)*, 46(8):2982–2985, 2010.
- [11] M. Mehri Dehnavi and D. Giannacopoulos. Enhancing the performance of electromagnetic applications on clustered architectures. *IEEE Transactions on Magnetics (TMAG)*, 45(3):1340–1343, 2009.

PEER REVIEWED
CONFERENCE
PUBLICATIONS

- [12] Y. You, D. Bader, and M. Mehri Dehnavi. An intelligent cross-architecture breadth first search for large-scale graph exploration. *The 43th International Conference on Parallel Processing (ICPP)*, 73–79, 2014.
- [13] Y. You, S. Song, H. Fu, A. Marquez, G. Yang, K. Barker, K. Cameron, M. Mehri Dehnavi, and A. Randles. MIC-SVM: Designing a highly efficient support vector machine for advanced modern multi-core and many-core architectures. *Proceedings of the International Parallel and Distributed Processing Symposium (IPDPS)*, 2014.
- [14] M. Mehri Dehnavi, D. Fernández, and D. Giannacopoulos. Finite element sparse matrix vector multiplication on GPUs. *IEEE Conference on Computational Electromagnetics (COMPUMAG)*, 1082–1084, 2009. **best paper finalist**.
- [15] M. Mehri Dehnavi, J. Demmel, and D. Giannacopoulos. Communication-avoiding algorithms on GPUs. *IEEE Conference on Electromagnetic Field Computation (CEFC)*, 2012.

- [16] M. Mehri Dehnavi, D. Fernández, and D. Giannacopoulos. Accelerating sparse approximate inverse preconditioners based on matrix entries on GPUs. *IEEE Conference on Computational Electromagnetics (COMPUMAG)*, 2011.
- [17] D. Fernández, J. Zambrano, M. Mehri Dehnavi, Y. El-Kurdi, and D. Giannacopoulos. Accelerating the convergence of the FEM single element solution method using multi-grid techniques. *XII International Congress on Numerical Methods in Engineering and Applied Sciences*, 2014.
- [18] D. Fernández, M. Mehri Dehnavi, and D. Giannacopoulos. Alternate approach to FEM for parallel processing. *IEEE Conference on Computational Electromagnetics (COMPUMAG)*, 2011.
- [19] M. Mehri Dehnavi, D. Fernández, and D. Giannacopoulos. Enhancing the performance of conjugate gradient solvers on GPUs. *IEEE Conference on Electromagnetic Field Computation (CEFC)*, 2010.
- [20] M. Mehri Dehnavi and D. Giannacopoulos. Enhancing the performance of electromagnetic applications on clustered architectures. *IEEE Conference on Electromagnetic Field Computation (CEFC)*, 2008.
- [21] M. Mehri Dehnavi and D. Giannacopoulos. Fast preconditioning on GPUs. *High Performance Computing Symposium in medical sciences*, 2011.
- [22] M. Mehri Dehnavi and D. Giannacopoulos. Accelerating finite element sparse matrix vector multiplication on GPUs. *Centre de Recherche en Electronique Radiofrequence (CREER)*, 2010.
- [23] M. Mehri Dehnavi and D. Giannacopoulos. Enhancing the performance of clustered architectures. *6th Interdisciplinary Graduate Student Research Symposium (IGTRS)*, 2010.
- [24] M. Mehri Dehnavi and W. Hassanein. A thread specific load balancing technique for a clustered SMT architecture. *Proceeding of Canadian Conference on Electrical and Computer Engineering (CCECE)*, 948–951, 2007.
- [25] M. Mehri Dehnavi and W. Hassanein. A clustered SMT architecture for scalable embedded processors. *Practical Real World Technologies for Communications and Embedded Platforms (PRWT)*, 201–203, 2007.
- [26] M. Mehri Dehnavi. Krylov subspace techniques on graphic processing units. Ph.D. Thesis, McGill University, 2012
- [27] M. Mehri Dehnavi. Characterizing and enhancing SMT clustered architectures. M.Sc Thesis, University of Calgary, 2007
- [28] M. Mehri Dehnavi and W. Hassanein. Characterizing the performance of data base management systems on the Pentium 4 Hyper-Threaded Architecture. Technical Report, University of Calgary, 2006
- [29] M. Mehri Dehnavi and W. Hassanein. CSMT-SIM: A clustered simultaneous multithreaded architecture Simulator. Technical Report, University of Calgary, 2007
- [30] W. Hassanein, L. Rashid, M. Mehri Dehnavi and W. Hassanein. Characterizing the performance of data base management systems on the Pentium 4 hyper-threaded architecture. Technical Report, University of Calgary, 2006

OTHER
CONFERENCE
PUBLICATIONS

THESIS AND
TECHNICAL
REPORTS

INDUSTRIAL
EXPERIENCE

- Qualcomm Inc.**, Canada Jul. 2012 to Feb. 2013
Senior R&D Engineer
- Supervisor: Alwyn Dos Remedios
 - Built CVCL to automatically generate parallel code for computer vision problems.
 - Optimized OpenCV and multimedia applications using OpenCL and CUDA.
 - Developed an autotuner for CVCL.

RESEARCH
EXPERIENCE

- Massachusetts Institute of Technology**, USA Feb. 2013 to present
Postdoctoral researcher
- Developed an autotuner for divide-and-conquer stencil computations.
 - Designed and implemented domain-specific compilers for stencil computations.
 - Reformulated and re-engineered the finite-element method for better scalability.
 - Accelerated machine learning algorithms on heterogeneous hardware platforms.
 - Designed a heuristic autotuner to tune the switching point in hybrid breadth-first search algorithms.

- University of California Berkeley**, USA Oct. 2011 to Apr. 2012
Visiting student researcher
- Accelerated communication-avoiding (CA) Krylov solvers on GPUs.
 - Designed and implemented preconditioning techniques for CA Krylov methods.

- University of California Irvine**, USA Jan. 2011 to Apr. 2011
Visiting student researcher
- Accelerated sparse approximate inverse preconditioners on manycore architectures.

- McGill University**, Canada 2008 to 2012
Research assistant
- Designed and implemented communication-reducing sparse data structures for sparse matrix computations.
 - Developed algorithms for accelerating Krylov solvers on GPUs.
 - Designed and implemented a runtime scheduler to improve the performance of electromagnetic simulations on clustered architectures.
 - Developed single-element solutions to the finite-element method for better scalability.
 - Accelerated preconditioned conjugate gradient methods on manycore hardware.

- University of Calgary**, Canada 2005 to 2007
Research assistant
- Designed and implemented a Clustered Simultaneous Multithreaded simulator (CSMT-SIM) to simulate clustering on simultaneous multithreaded processors.

TEACHING
EXPERIENCE

- Massachusetts Institute of Technology**, USA Fall 2013
Recitation instructor and teaching assistant
- 6.172: Performance Engineering of Software Systems
- Designed projects, assignments, and recitation material.
 - Held recitation sessions, office hours, and graded exams.
- Student mentoring* Winter 2013 to present
- Mentored a Ph.D. student at MIT in developing autotuners for stencil code.
 - Mentored an M.Sc. student from Tsinghua university in accelerating machine learning and breadth-first search algorithms on heterogeneous architectures.

- Padova University**, Italy Summer 2011
Invited lecturer
- Lecture: Algorithms and Architectures for CSE
- Gave a lecture series (3 days) on computational science and engineering.

McGill University, Canada

Lab. instructor Fall 2009 and Fall 2010

ECSE 291: Electrical measurements lab.

- Supervised lab sessions and graded lab reports.

Recitation instructor and teaching assistant

Winter 2008 and Winter 2009

ECSE 425: Computer Organization and Architecture

- Held tutorial sessions and office hours.
- Designed and graded assignments and exams.

Student mentoring

2010 to 2011

- Mentored three undergraduate students on developing a fast MRI imaging software on GPUs.

University of Calgary, Canada

Recitation instructor and teaching assistant

Fall 2006 and Winter 2007

ENCM 501: Principles of Computer Architecture

- Held tutorial sessions and office hours.
- Designed and graded assignments and exams.

Lab. instructor

Fall 2005 and Winter 2006

ENEL 399: Programming Fundamentals

ENEL 409: Principles of Software Development

- Supervised lab sessions and graded lab reports.

SELECTED INVITED LECTURES AND PRESENTATIONS Algorithms and Architectures for Computational Science and Engineering. Invited lecturer, PhD summer school in Padova University, Italy, 2011.

Center for Exascale Simulation of Plasma-Coupled Combustion. UIUC, USA, 2014.

IBM Research Yorktown heights. USA, 2014.

Northeastern University. Computer Science Department, USA, 2014.

Qualcomm Canada Inc. Canada, 2012.

Samsung Research America. USA, 2011.

13th Biennial IEEE Conference on Electromagnetic Field Computation. Greece, 2008.

17th Conference on the Computation of Electromagnetic Fields. Brazil, 2009.

14th Biennial IEEE Conference on Electromagnetic Field Computation. USA, 2010.

18th Conference on the Computation of Electromagnetic Fields. Australia, 2009.

6th Interdisciplinary Graduate Student Research Symposium. Canada, 2010.

High Performance Computing Symposium in Medical Sciences. Canada, 2011.

PROFESSIONAL SERVICE

Committee Service

- *Program Committee, Workshop on Energy Aware Big Data Computing in Telecomm*
- *Program Committee, The International Conference on Parallel Processing (applications track, ICPP 2015)*

Referee Service

- *IEEE transactions on Parallel and Distributed Systems*
- *International Conference on Parallel Processing*
- *International Conference on Distributed Computing and Networking*
- *IEEE transactions on Magnetics*
- *Workshop on Energy Aware Big Data Computing in Telecommunications*

Other services

- *McGill Undergraduate Poster Tutorial–Mentor*
- *MIT Undergraduate Women’s Mentoring Program–Organizer*

**REFERENCES
AVAILABLE TO
CONTACT****Charles E. Leiserson** (cel@mit.edu; phone: +1-617-253-5833)

- Professor, Computer Science and Artificial Intelligence, MIT

Dennis Giannacopoulos (dennis.giannacopoulos@mcgill.ca; phone: +1-514-398-7128)

- Associate Professor, Electrical and Computer Engineering, McGill University

James Demmel (demmel@cs.berkeley.edu; phone: +1-510-643-5386)

- Professor, Computer Science, University of California Berkeley

Jean-Luc Gaudiot (gaudiot@uci.edu; phone: +1-949-824-9748)

- Professor, Electrical and Computer Science, University of California Irvine

Steve McFee (steve.mcfee@mcgill.ca; phone: +1-514-398-8916)

- Associate Professor, Electrical and Computer Engineering, McGill University