

## Mario J. Badr

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CONTACT INFORMATION	The Edward S. Rogers Department of Electrical and Computer Engineering Room 1107, Sandford Fleming Bldg. 10 King's College Road, Toronto, ON M5S 3G4 Canada University of Toronto
RESEARCH INTERESTS	Many-core/multi-core/heterogeneous architectures, synchronization, cache coherence, interconnection networks, analytical models, computer systems performance analysis, energy harvesting.
EDUCATION	<p><b>Ph.D., Computer Engineering</b> August 2019 (expected) <i>University of Toronto</i> Toronto, Ontario, Canada Dissertation: "Novel Evaluation Methodologies for Future Architectures" Advisor: Natalie Enright Jerger</p> <p><b>M.A.Sc, Computer Engineering</b> January 2014 <i>University of Toronto</i> Toronto, Ontario, Canada Thesis: "Synthetic Traffic Models that Capture Cache Coherence Behaviour" Advisor: Natalie Enright Jerger</p> <p><b>B.A.Sc, Electrical Engineering</b> May 2011 <i>University of Toronto</i> Toronto, Ontario, Canada</p>
INDUSTRY EXPERIENCE	<p><b>Qualcomm Research Silicon Valley</b> Santa Clara, California, USA <i>Intern (C++, OpenCL, Hexagon, CMake)</i> May, 2015 - August, 2015 Used the Multicore Asynchronous Runtime Environment (MARE) to develop a heterogeneous application with multiple domain-specific kernels. Provided feedback to the MARE team on performance issues and bottlenecks.</p> <p><b>Environment Canada</b> Toronto, Ontario, Canada <i>Intern (Java, XML)</i> June, 2009 - August, 2010 Implemented new features and bug fixes for the NinJo workstation, a tool for meteorologists. Notable projects include upgrading the visualization framework for lightning strikes to be faster and use significantly less memory, incorporating storm cell data for Canada, and helping to create a configurable view of weather data for a given storm cell.</p>
AWARDS & SCHOLARSHIPS	<p><b>Ontario Graduate Scholarship - \$15,000 per year</b> 2017, 2018 Awarded for excellence in graduate studies.</p> <p><b>Electrical &amp; Computer Engineering Teaching Assistant Award</b> 2016 Awarded by student vote and department review to the top three teaching assistants for the Fall semester.</p> <p><b>Roberto Padovani Intern Scholarship - \$5,000</b> 2015 Awarded to seven Qualcomm Research interns across the globe for outstanding technical contributions made during their internship.</p> <p><b>Thomas Noakes &amp; Queen Elizabeth II Graduate Scholarship - \$15,000</b> 2015 Awarded for excellence in science and technology.</p>

**Teaching Assistant Teaching Excellence Award - \$200**

2015

Awarded to four recipients across the three University of Toronto campuses based on nominations, references, and teaching philosophy.

JOURNAL  
PUBLICATIONS

**Mario Badr**, and Natalie Enright Jerger. “A High-Level Model for Exploring Multi-Core Architectures.” In *Parallel Computing (PARCO)*, 2018.

Joshua San Miguel, Karthik Ganesan, **Mario Badr**, and Natalie Enright Jerger. “The EH Model: Analytical Exploration of Energy-Harvesting Architectures.” In *IEEE Computer Architecture Letters (CAL)*, vol. 17, no. 1, pp. 76-79, January-June 2018.

CONFERENCE  
PUBLICATIONS

Joshua San Miguel, Karthik Ganesan, **Mario Badr**, Steven Xia, Rose Li, Hsuan Hsiao, and Natalie Enright Jerger. “The EH Model: Early Design Space Exploration of Intermittent Processor Architectures.” To appear in *Proceedings of the International Symposium on Microarchitecture (MICRO)*, October 2018 (acceptance rate: 21%).

Joshua San Miguel, **Mario Badr**, and Natalie Enright Jerger. “Load Value Approximation.” In *Proceedings of the International Symposium on Microarchitecture (MICRO)*, December 2014 (acceptance rate: 19%), pp. 127-139. Citations: 72.

**Mario Badr** and Natalie Enright Jerger. “SynFull: Synthetic Traffic Models Capturing a Full Range of Cache Coherence Behaviour.” In *Proceedings of the International Symposium on Computer Architecture (ISCA)*, June 2014 (acceptance rate: 18%), pp. 109-120. Citations: 66.

WORKSHOP  
PUBLICATIONS

**Mario Badr** and Natalie Enright Jerger. “Fast and Accurate Performance Analysis of Synchronization.” In *Proceedings of the 9th International Workshop on Programming Models and Applications for Multicores and Manycores (PMAM)*, February 2018 (acceptance rate: 53%), pp. 31-40.

**Mario Badr** and Natalie Enright Jerger. “A Look at Computer Architecture Evaluation Methodologies.” In *The 2nd Workshop on Pioneering Processor Paradigms (WP3)*, February 2018.

Tushar Kumar, Aravind Natarajan, Wenjia Ruan, **Mario Badr**, Dario Suarez Gracia, Calin Cascaval. “Abstract Representation of Shared Data for Heterogeneous Computing.” In *The 30th International Workshop on Languages and Compilers for Parallel Computing (LCPC)*, October 2017 (acceptance rate: 65%).

Ajaykumar Kannan, **Mario Badr**, Parisa Khadem Hamedani and Natalie Enright Jerger. “Offloading to the GPU: An Objective Approach.” In *The 3rd International Workshop on Parallelism in Mobile Platforms (PRISM)*, June 2015.

PRESENTATIONS

**Mario Badr** and Natalie Enright Jerger. *Fast and Accurate Performance Analysis of Synchronization*. At the 9th International Workshop on Programming Models and Applications for Multicores and Manycores (PMAM), February 2018.

**Mario Badr** and Natalie Enright Jerger. *A Look at Computer Architecture Evaluation Methodologies*. At the Second Workshop on Pioneering Processor Paradigms (WP3), February 2018.

**Mario Badr**, Natalie Enright Jerger, Riken Gohil, Radhika Jagtap, and Matteo Andreozzi. *Generating Synthetic Traffic for Heterogeneous Architectures* At the ARM Research Summit, September 2017.

**Mario Badr** and Natalie Enright Jerger. *SynFull: Traffic Models Capturing Cache Coherence Behaviour*. At the International Symposium on Computer Architecture (ISCA), June 2014.

PANELS

Panelist: *Teaching Tips*. At the University of Toronto Tri-Campus Teaching Assistant Day, August 2018.

Panelist: *Retrospective Vision: A Blessing or a Curse?* At the Second Workshop on Pioneering Processor Paradigms (WP3), February 2018.

Panelist: *Teaching Tips*. At the University of Toronto Tri-Campus Teaching Assistant Day, August 2015.

SOFTWARE  
ARTIFACTS

**Memory Access Tracer** *Apache License 2.0*

A tool for instrumenting an application binary's reads and writes to produce a trace. The traces can be used to learn more about the application's memory behaviour or drive a simulation of a memory hierarchy design. Available: <https://github.com/mariobadr/memory-access-tracer>

**STM Cloning** *Apache License 2.0*

An implementation of a statistical profiling technique proposed in the literature (STM: Cloning the spatial and temporal memory access behavior). Available: <https://github.com/mariobadr/stm-cloning>

**Reuse Distance** *Apache License 2.0*

A library that can be used to calculate the reuse distance between subsequent memory requests. Available: <https://github.com/mariobadr/reuse-distance>

**Cluster** *Apache License 2.0*

A library that can be used to group data based on different features via the partition around medoids algorithm. Available: <https://github.com/mariobadr/cluster>

**SimSync** *Apache License 2.0*

A tool for analyzing the performance of multi-threaded applications on multi- and many-core processors. SimSync focuses on the impact synchronization has on the performance of each thread. Available: <https://github.com/mariobadr/simsync-pmam>

**SynFull** *MIT License*

An implementation of a statistical simulation methodology for design-space exploration of Networks-on-Chip. Includes R scripts for creating models and an executable to generate synthetic traffic. Available: <https://github.com/mariobadr/synfull-isca>

TEACHING  
EXPERIENCE

**Computer Fundamentals** Course Instructor

*APS105 (core), Winter 2019* *1st Year Undergraduates*

Currently (Winter 2019) instructing undergraduate students in an introduction to computer programming in C. Students in my section come from a variety of backgrounds, with 75% enrolled in Track One and 25% enrolled in Electrical and Computer Engineering (over 100 students).

**Microprocessor Systems** Course Instructor

*CSC385 (elective), Fall 2018* *3rd & 4th Year Undergraduates*

Instructed computer science undergraduates on topics related to computer organization and architecture (22 students).

**Computer Programming** Teaching Assistant  
*APS105, APS106, ECE244, ECE297 (core), 2013-2018* *1st & 2nd Year Undergraduates*  
 Taught computer programming using the C (APS105, APS105T, APS106) and C++ languages (ECE244, ECE297) in tutorials (10-80 students) and computer labs.

In addition to tutorials and labs, I have also delivered lectures and developed course materials. For APS105, I delivered the 2013 Exam Jam review session. For ECE244, I delivered two lectures on recursion using an in-depth maze example with a step-by-step visualization of the maze traversal. For ECE297, I proposed, developed, and delivered optional tutorials on software design.

**Computer Organization & Architecture** Teaching Assistant  
*ECE352, ECE552 (elective), 2012-2015* *3rd & 4th Year Undergraduates, Graduates*  
 Supervised and helped students implement a simple von Neumann processor using verilog in a computer lab setting (ECE352). Also taught computer architecture concepts (e.g., caches, pipelining, register renaming, prefetching) in the lab (ECE552). Delivered tutorials on Amdahl's Law, quantitative analysis, cache coherence, and memory consistency.

**Engineering Communication and Design** Teaching Assistant  
*APS111, APS112 (core), 2012-2015* *1st Year Undergraduates*  
 Facilitated tutorials for group projects with a focus on the engineering design process including how to: define the problem, develop solutions, and objectively compare designs. Also participated in the summer-session for students who were struggling with their course load (the T-Program).

UNIVERSITY  
SERVICE

**Appointed Graduate Representative** 2015-2016  
 Executive Committee of Faculty Council - Faculty of Applied Science & Engineering

**Graduate Representative** 2015-2016  
 Faculty Council - Faculty of Applied Science & Engineering

**President** 2015-2016  
 Electrical and Computer Engineering Graduate Students' Society

**Department Steward** 2013-2014  
 Canadian Union of Public Employees

**Social Event Coordinator** 2012-2013  
 Electrical and Computer Engineering Graduate Students' Society

PROFESSIONAL  
DEVELOPMENT

**Teaching in Higher Education** 2015  
*THE500* *Woodsworth College, University of Toronto*  
 Learned more about teaching theories and styles. Was observed by peers while teaching a tutorial on Computer Architecture. Developed a course syllabus for a fictitious course.

**Teaching Engineering in Higher Education** 2015  
*APS1203* *Faculty of Applied Science & Engineering, University of Toronto*  
 Studied concepts and research on curriculum, teaching, and learning in engineering education.

**Prospective Professors in Training** 2014-2015  
*Thirteen Seminars* *Faculty of Applied Science & Engineering, University of Toronto*  
 Began preparations for becoming a professor in academia and prepared an academic dossier.

**Mini-MBA** 2015  
*Ten Workshops* *Graduate Management Consulting Association, University of Toronto*  
 Gained an understanding of fundamental business concepts and participated a case competition.

- Oral Presentation Skills** 2014  
*Five Workshops* *English Language and Writing Support, University of Toronto*  
Examined presentation structure and the use of visual aids. Exchanged feedback with peers.
- Prewriting Strategies for Developing and Organizing Your Ideas** 2014  
*Four Workshops* *English Language and Writing Support, University of Toronto*  
Learned several new strategies for developing and organizing ideas before the writing process.
- NSERC Proposal Workshop** 2014  
*Three Sessions* *English Language and Writing Support, University of Toronto*  
Examined features of good and bad proposal writing, and exchanged feedback with peers.
- Teaching Fundamentals Certificate** 2012-2013  
*Six Workshops* *Centre for Teaching Support and Innovation, University of Toronto*  
Improved my teaching skills with workshops on pedagogy, research, academic integrity, and students in difficulty.