Mario J. Badr

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.

Education

Ph.D., Computer Engineering — September, 2013 - Present
University of Toronto — *Toronto, Ontario, Canada*
Dissertation: "Novel Evaluation Methodologies for Future Architectures"
Advisor: Natalie Enright Jerger

M.A.Sc, Computer Engineering — January 2014
University of Toronto — *Toronto, Ontario, Canada*
Thesis: "Synthetic Traffic Models that Capture Cache Coherence Behaviour"
Advisor: Natalie Enright Jerger

B.A.Sc, Electrical Engineering — May 2011
University of Toronto — *Toronto, Ontario, Canada*

Industry Experience

Qualcomm Research Silicon Valley — Santa Clara, California, USA
Intern (C++, OpenCL, Hexagon, CMake) — *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.

Environment Canada — Toronto, Ontario, Canada
Intern (Java, XML) — *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.

Awards & Scholarships

Ontario Graduate Scholarship - *$15,000* — *2017*
Awarded for excellence in graduate studies.

Electrical & Computer Engineering Teaching Assistant Award — *2016*
Awarded by student vote and department review to the top three teaching assistants for the Fall semester.

Roberto Padovani Intern Scholarship - *$5,000* — *2015*
Awarded to seven Qualcomm Research interns across the globe for outstanding technical contributions made during their internship.

Thomas Noakes & Queen Elizabeth II Graduate Scholarship - *$15,000* — *2015*
Awarded for excellence in science and technology.

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

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), November 2017.

Conference Publications

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%)

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%)

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%)

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, 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.

Mario Badr and Natalie Enright Jerger. *SynFull: Synthetic Traffic Models That Capture Cache Coherent Behaviour.* At the University of Toronto Electrical and Computer Engineering Graduate Symposium (Connections), May 2014. Awarded *Best Oral Presentation*.

Mario Badr and Natalie Enright Jerger. *Realistic Synthetic Traffic* At the University of Toronto Electrical and Computer Engineering Graduate Symposium (Connections), May 2012.

Software Artifacts

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 of synchronization on the performance of each thread. Available: *https://github.com/mariobadr/simsync-pmam*

SynFull *MIT License*
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

Engineering Strategies and Practice 1st Year Undergraduates, T-Program
Teaching Assistant *Tutorials*
Supervised students through the design process for a given project and provided feedback on written design documents, with a focus on stimulating an engineering methodology to design.

Computer Fundamentals 1st Year Undergraduates, T-Program
Teaching Assistant *Tutorials, Computer Lab*
Taught the fundamentals of computer programming in C, including data structures, recursion, and sorting algorithms. Also delivered the 2013 Exam Jam review session.

Programming Fundamentals 2nd Year Undergraduates
Teaching Assistant, Substitute Lecturer *Tutorials*
Taught the fundamentals of C++ and object-oriented programming, including value versus reference semantics and memory management on the stack and heap. Delivered two lectures on recursion using an in-depth maze example with a step-by-step visualization of the maze traversal.

Communication and Design 2nd Year Undergraduates
Teaching Assistant, Course Development *Tutorials, Computer Lab*
Mentored student groups in the implementation of an application that visualizes and finds routes in a city map. Developed six new tutorials in 2017 to help students with software engineering.

Computer Organization 3rd Year Undergraduates
Teaching Assistant *Computer Lab*
Supervised and helped students implement a simple von Neumann processor using verilog.

Computer Architecture 4th Year Undergraduates & Graduates
Teaching Assistant *Computer Lab*
Taught computer architecture concepts (e.g., caches, pipelining, out-of-order cores, multicore).

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
One semester course
Learned more about teaching theories and styles and 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
One semester course
Studied concepts and research on curriculum, teaching, and learning in engineering education.

Prospective Professors in Training 2014-2015
Thirteen Seminars, One semester course
Began preparations for becoming a professor in academia and prepared an academic dossier.

Mini-MBA 2015
Ten Classes
Gained an understanding of fundamental business concepts and participated a case competition.

Oral Presentation Skills 2014
Five Classes
Examined presentation structure and the use of visual aids. Exchanged feedback with peers.

Prewriting Strategies for Developing and Organizing Your Ideas 2014
Four Classes
Learned several new strategies for developing and organizing ideas before the writing process.

NSERC Proposal Workshop 2014
Three Classes
Examined features of good and bad proposal writing, and exchanged feedback with peers.

Teaching Fundamentals Certificate 2012-2013
Six Workshops
Improved my teaching skills with workshops on pedagogy, research, academic integrity, and students in difficulty.