Mark Christopher Jeffrey

Contact Information

The Edward S. Rogers Department
of Electrical and Computer Engineering
10 King's College Road
University of Toronto
Toronto, ON, M5S 3G4, Canada

mcj@ece.utoronto.ca
www.eecg.utoronto.ca/~mcj

Research Interests

Computer architecture, computer systems, parallel computing, parallel programming models, speculative execution, data-centric execution, compilers, irregular algorithms, reconfigurable hardware

Education

Massachusetts Institute of Technology

Doctor of Philosophy, Electrical Engineering and Computer Science **2019**
Thesis: *A hardware and software architecture for pervasive parallelism.*
Advisor: Professor Daniel Sanchez

University of Toronto

Master of Applied Science, Computer Engineering **2011**
Thesis: *Understanding and improving Bloom filter configuration for lazy address-set disambiguation.*
Advisor: Professor J. Gregory Steffan

Bachelor of Applied Science in Engineering Science with Honors **2009**

Appointment

University of Toronto, Electrical and Computer Engineering, Toronto, Canada
Assistant Professor **August 2020 – present**

Industry Experience

Facebook, Cambridge, Massachusetts
Research Scientist, Facebook Artificial Intelligence Research **October 2019 – July 2020**

Google, Mountain View, California
Software Engineering Intern, Platforms Performance **June 2015 – August 2015**

AeroFS, Palo Alto, California
Software Engineer **September 2011 – May 2013**

EPSON, Toronto, Canada
Software Development Intern **May 2007 – August 2008**

Neufeld Learning Systems, London, Canada
Software Development Intern **Summer 2005, Summer 2006**

Honours and Awards

MIT George M. Sprowls Computer Science Doctoral Thesis Award, 2nd Place **2021**
Best Graduate Poster, Industry-Academia Partnership MIT Cloud Workshop **2018**
Facebook PhD Fellowship ($181,000) **2017**
Honourable mention in IEEE Micro "Top Picks from the Computer Architecture Conferences" **2017**
Paper selected for IEEE Micro "Top Picks from the Computer Architecture Conferences" **2016**
NSERC (NSF-equivalent) Post-Graduate Scholarship (PGS-D3 $63,000) **2013**

Honours and Awards (Continued)

MIT Irwin Mark Jacobs and Joan Klein Jacobs Presidential Fellowship ($69,166)	**2013**
Best Presentation, Connections Graduate Symposium, University of Toronto	**2011**
NSERC Alexander Graham Bell Canada Graduate Scholarship (CGS-M $17,500)	**2010**
Best Paper, International Symposium on Applied Reconfigurable Computing	**2010**
L.E. Jones Award of Distinction, Engineering Alumni Association, University of Toronto	**2009**
Canada Millennium Scholarship Excellence Award ($4,000)	**2006**
University of Toronto #2 Canadian Army University Course Award ($1,300)	**2006**
University of Toronto Scholar ($3,000)	**2004**

Peer-Reviewed Conference Publications

[C.9] K. Maeng, S. Bharuka, I. Gao, M. C. Jeffrey, V. Saraph, B.-Y. Su, C. Trippel, J. Yang, M. Rabbat, B. Lucia, and C.-J. Wu, "CPR: Understanding and improving failure tolerant training for deep learning recommendation with partial recovery," in *Proc. of the 4th Conference on Machine Learning and Systems (MLSys)*, April 2021

[C.8] V. A. Ying, M. C. Jeffrey, and D. Sanchez, "T4: Compiling sequential code for effective speculative parallelization in hardware," in *Proc. of the 47th ACM/IEEE International Symposium on Computer Architecture (ISCA-47)*, June 2020

[C.7] M. C. Jeffrey, V. A. Ying, S. Subramanian, H. R. Lee, J. Emer, and D. Sanchez, "Harmonizing speculative and non-speculative execution in architectures for ordered parallelism," in *Proc. of the 51st IEEE/ACM International Symposium on Microarchitecture (MICRO-51)*, October 2018, pp. 217–230

[C.6] M. Abeydeera, S. Subramanian, M. C. Jeffrey, J. Emer, and D. Sanchez, "SAM: Optimizing multithreaded cores for speculative parallelism," in *Proc. of the 26th International Conference on Parallel Architectures and Compilation Techniques (PACT-26)*, September 2017, pp. 64–78

[C.5] S. Subramanian, M. C. Jeffrey, M. Abeydeera, H. R. Lee, V. A. Ying, J. Emer, and D. Sanchez, "Fractal: An execution model for fine-grain nested speculative parallelism," in *Proc. of the 44th ACM/IEEE International Symposium on Computer Architecture (ISCA-44)*, June 2017, pp. 587–599

[C.4] M. C. Jeffrey, S. Subramanian, M. Abeydeera, J. Emer, and D. Sanchez, "Data-centric execution of speculative parallel programs," in *Proc. of the 49th IEEE/ACM International Symposium on Microarchitecture (MICRO-49)*, October 2016, pp. 5:1–5:13
(Honourable mention for IEEE Micro's Top Picks)

[C.3] M. C. Jeffrey, S. Subramanian, C. Yan, J. Emer, and D. Sanchez, "A scalable architecture for ordered parallelism," in *Proc. of the 48th IEEE/ACM International Symposium on Microarchitecture (MICRO-48)*, December 2015, pp. 228–241
(Selected for IEEE Micro's Top Picks issue of "most significant papers in computer architecture based on novelty and long-term impact")

[C.2] M. C. Jeffrey and J. G. Steffan, "Understanding Bloom filter intersection for lazy address-set disambiguation," in *Proc. of the 23rd ACM Symposium on Parallelism in Algorithms and Architectures (SPAA)*, June 2011, pp. 345–354

[C.1] M. Labrecque, M. C. Jeffrey, and J. G. Steffan, "Application-specific signatures for transactional memory in soft processors," in *Proc. of the 6th International Symposium on Applied Reconfigurable Computing (ARC)*, March 2010, pp. 42–54

Peer-Reviewed Journal Publications

[J.2] M. C. Jeffrey, S. Subramanian, C. Yan, J. Emer, and D. Sanchez, "Unlocking ordered parallelism with the Swarm architecture," *IEEE Micro's Top Picks*, 36(3):105–117, 2016

[J.1] M. Labrecque, M. C. Jeffrey, and J. G. Steffan, "Application-specific signatures for transactional memory in soft processors," *ACM Transactions on Reconfigurable Technolology and Systems (TRETS)*, 4(3):21:1–21:14, 2011

Teaching

University of Toronto, Toronto, Ontario

Instructor, ECE552 Computer Architecture	**Fall 2021**
Instructor, ECE1755 Parallel Computer Architecture and Programming	**Winter 2021**
Instructor, ECE552 Computer Architecture	**Fall 2020**

Massachusetts Institute of Technology, Cambridge, Massachusetts

Guest Lecturer, 6.823 Computer System Architecture	**Spring 2019**
Guest Lecturer, 6.886 Graph Analytics	**Spring 2018**
Teaching Assistant, 6.823 Computer System Architecture	**Spring 2017**

Insight Data Science Fellows Program, Palo Alto, California

Mentor	**September 2012, March 2013**

University of Toronto, Toronto, Canada

Teaching Assistant, ECE353 Systems Software	**Spring 2010**, **Spring 2011**
Teaching Assistant, ECE454 Computer Systems Programming	**Fall 2010**
Teaching Assistant, ESC103 Engineering Mathematics and Computation	**Fall 2009**
Teaching Assistant, MAT190 Vector and Matrix Algebra	**Fall 2008**

Student Supervision

Isidor Brkic, M.A.Sc. student	**2020 - present**
Gilead Posluns, M.A.Sc. student	**2020 - present**
Jerry He, B.A.Sc. thesis student	**2021 - present**
Billy Boyle, B.A.Sc. thesis student	**2020 - 2021**
Yan Zhu, B.A.Sc. Engineering Science Research Opportunities Program student	**2021**

Invited Talks

Performance for all: simplifying hard parallelism and specialization

Huawei	**October 2021**

Making parallelism pervasive with the Swarm architecture

Facebook	**September 2019**
Google	**May 2019**
University of Pennsylvania	**April 2019**
University of Toronto	**March 2019**
University of Waterloo	**March 2019**
University of Texas at Austin	**March 2019**
Simon Fraser University	**January 2019**
Facebook	**September 2017**
Center for Future Architectures Research e-Workshop	**July 2017**
University of Toronto Computer Architecture Seminar	**March 2017**
BARC: Boston Area Architecture Workshop	**January 2017**

Harmonizing speculative and non-speculative execution in architectures for ordered parallelism

IEEE/ACM International Symposium on Microarchitecture	**October 2018**

Data-centric execution of speculative parallel programs

IEEE/ACM International Symposium on Microarchitecture	**October 2016**

A scalable architecture for ordered parallelism

IEEE/ACM International Symposium on Microarchitecture	**December 2015**

Invited Talks (Continued)

Improving Bloom filter configuration for lazy transactional memory
CASCON, IBM Canada Software Laboratory **November 2011**

Understanding Bloom filter intersection for lazy address-set disambiguation
ACM Symposium on Parallelism in Algorithms and Architectures **June 2011**
University of Toronto Connections ECE Graduate Symposium **May 2011**

GPU-accelerated software transactional memory
University of Toronto Connections ECE Graduate Symposium **May 2010**

Mentoring and Outreach

Panelist
"Working in Academia", Division of Engineering Science at the University of Toronto **November 2021**
"Working in Academia", Division of Engineering Science at the University of Toronto **March 2021**
"Former Fellows Panel", Facebook Fellowship Summit **September 2020**

Mentor
Undergrad Architecture Mentoring (uArch) Workshop **2021**
Meet a Senior Architect Program, ASPLOS, ISCA, and MICRO **2021**
Meet a Senior Architect Program, ISCA and MICRO **2020**

Professional Service

Program Committee Member
International Symposium on Microarchitecture (MICRO) **2020**

External Review Committee Member
International Symposium on Computer Architecture (ISCA) **2022**
Intl. Conf. on Architectural Support for Programming Langs. and Operating Systems (ASPLOS) **2022**
International Symposium on Microarchitecture (MICRO) **2021**
Intl. Conf. on Architectural Support for Programming Langs. and Operating Systems (ASPLOS) **2021**

Reviewer
IEEE Computer Architecture Letters (CAL) **2020**
Symposium on Principles and Practice of Parallel Programming (PPoPP) **2016**

Web Chair
International Symposium on Computer Architecture (ISCA) **2022**

Submissions Co-Chair
International Symposium on Microarchitecture (MICRO) **2017**