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Stephen Chou

Education

02/2018–present **PhD, Computer Science**, *Massachusetts Institute of Technology*.
Research focus: programming languages and compilers for performance computing.
Advised by Prof. Saman Amarasinghe.

09/2015–02/2018 **SM, Computer Science**, *Massachusetts Institute of Technology*.
Thesis: Unified Sparse Formats for Tensor Algebra Compilers.
Advised by Prof. Saman Amarasinghe.

09/2010–06/2015 **BASc, Computer Engineering**, *University of Waterloo*.
Dean's Honours List with Distinction (GPA: 94%).

Research Experience

09/2015–present **Massachusetts Institute of Technology**, Cambridge, MA.
Generalized the taco tensor algebra compiler theory to support generating code for efficiently computing with sparse tensors stored in disparate formats.

06/2018–08/2018 **Microsoft**, Redmond, WA.
Designed and implemented a prototype framework for specifying and automatically applying high-level architectural optimizations to improve the performance of deep learning models. Worked with Minjia Zhang and Yuxiong He.

01/2015–08/2015 **University of Waterloo**, Waterloo, ON.
Developed SMT models of capillary electrophoresis devices and implemented them in Manifold compiler's microfluidic synthesis back end. Worked with Prof. Derek Rayside.

08/2012–12/2012 **Sybase**, Waterloo, ON.
01/2012–04/2012 Developed tools and investigated techniques for improving the performance of join optimization in Sybase SQL Anywhere's query optimizer. Worked with Anisoara Nica.

Publications

Conference Publications

OOPSLA 2020 Ryan Senanayake, Changwon Hong, Ziheng Wang, Amalee Wilson, Stephen Chou, Shoaib Kamil, Saman Amarasinghe, Fredrik Kjolstad. A Sparse Iteration Space Transformation Framework for Sparse Tensor Algebra. In *Proceedings of the ACM on Programming Languages, Volume 4, Issue OOPSLA*, 2020.

PLDI 2020 Stephen Chou, Fredrik Kjolstad, Saman Amarasinghe. Automatic Generation of Efficient Sparse Tensor Format Conversion Routines. In *Proceedings of the 41st ACM SIGPLAN International Conference on Programming Language Design and Implementation*, 2020.

OOPSLA 2018 Stephen Chou, Fredrik Kjolstad, Saman Amarasinghe. Format Abstraction for Sparse Tensor Algebra Compilers. In *Proceedings of the ACM on Programming Languages, Volume 2, Issue OOPSLA*, 2018.

OOPSLA 2017 Fredrik Kjolstad, Shoaib Kamil, Stephen Chou, David Lugato, Saman Amarasinghe. The Tensor Algebra Compiler. In *Proceedings of the ACM on Programming Languages, Volume 1, Issue OOPSLA*, 2017. [**Distinguished Paper Award**]

Peer-Reviewed Short/Workshop Publications

SPAA 2020 Suzanne Mueller, Peter Ahrens, Stephen Chou, Fredrik Kjolstad, Saman Amarasinghe. Sparse Tensor Transpositions. In *Proceedings of the 32nd ACM Symposium on Parallelism in Algorithms and Architectures (brief announcement)*, 2020.

Chocs Avancées David Lugato, Fredrik Kjolstad, Stephen Chou, Saman Amarasinghe, Shoaib Kamil. Taco: compilation et génération de code d'expressions tensorielles. In *Chocs Avancées*, No. 12, 2018.

ASE 2017 Fredrik Kjolstad, Stephen Chou, David Lugato, Shoaib Kamil, Saman Amarasinghe. taco: A Tool to Generate Tensor Algebra Kernels. In *Proceedings of the 32nd IEEE/ACM International Conference on Automated Software Engineering (tools paper and demo)*, 2017.

DBTest 2013 Anisoara Nica and Stephen Chou. Using Similarity Distance for Performance Prediction of the Query Optimization Process. In *Proceedings of the Sixth International Workshop on Testing Database Systems*, 2013.

Patents

01/2013 **Resource Estimation For A Query Optimization Process**.
Anisoara Nica and Stephen Chou.
Application number: US 13/754,596. Publication number: US9298771 B2.

Awards & Honors

10/2017 **Distinguished Paper Award**, *OOPSLA 2017.*

06/2015 **Albert Sherwood Barber Medal for Best Overall Work Term and Academic Performance**, *University of Waterloo.*

02/2015 **First in Class Engineering Scholarship for 4A term**, *University of Waterloo.*

06/2014 **First in Class Engineering Scholarship for 3B term**, *University of Waterloo.*

10/2013 **First in Class Engineering Scholarship for 3A term**, *University of Waterloo.*

07/2012 **iAnywhere Solutions Inc. Scholarship**, *University of Waterloo.*

Professional Service

Journal Review **IEEE TC:** Transactions on Computers (2019)

Conference Review **Euro-Par:** European Conference on Parallel and Distributed Computing (2020)

SPAA: Symposium on Parallelism in Algorithms and Architectures (2019)

PLDI: Programming Language Design and Implementation (2019)

CGO: Symposium on Code Generation and Optimization (2017, 2018)

Committees **CGO 2020** Artifact Evaluation Committee

Talks

Format Abstractions for Sparse Tensor Algebra Compilers

07/2020 MIT Fast Code Seminar

06/2020 Programming Language Design and Implementation (PLDI)

02/2019 ADA Liaison Meeting Talk

01/2019 Invited Workshop on Compiler Techniques for Sparse Tensor Algebra, MIT

11/2018 Object-Oriented Programming, Systems, Languages, and Analysis (OOPSLA)

Industry Experience

09/2014–12/2014 **Compiler Optimization Developer Co-op**, *IBM Canada*, Markham, ON.
01/2014–04/2014 Extended IBM XL compiler's high-level optimizer to vectorize type conversions (yielding up to ~30% performance gain on some SPEC benchmarks) and developed an alternative cost model for the auto-SIMDizer. Also investigated and fixed defects in the optimizer.

05/2013–08/2013 **Software Engineering Intern**, *OptumSoft*, Menlo Park, CA.
Designed and implemented prototype for a GraphLab-inspired distributed graph processing framework in the TACC programming language.

05/2011–08/2011 **Software Developer Co-op**, *Sybase*, Waterloo, ON.
Developed a replacement system entirely in Sybase SQL for aggregating Sybase product crash reports and usage statistics.