Fredrik Berg Kjolstad

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Academic Positions

2020–present **Assistant Professor**, *Stanford University*.

Education

February 2020 **Ph.D., Computer Science**, *Massachusetts Institute of Technology*.
Thesis: Code Generation for Sparse Computation
Adviser: Saman Amarasinghe
Award: First Place MIT EECS George M. Sprowls PhD Thesis Award in Computer Science, 2020

August 2011 **M.S. Computer Science**, *University of Illinois at Urbana-Champaign*.
Thesis: Refactoring Transformations for Maintainable, Scalable and Efficient Parallelism
Adviser: Marc Snir
Award: Best Poster Award at the UIUC Grad Expo (M.S. and Ph.D.).

June 2005 **B.E., Computer Science**, *Norwegian University of Science and Technology in Gjøvik*.
Bachelor project: Stopmotion
Awards: Rosing Student Award from the Norwegian Computer Society and Eureka Award from the
Norwegian University of Science and Technology in Gjøvik.

Publications

Conference and Journal Publications

SC 2022 SpDISTAL: Compiling Distributed Sparse Tensor Computations. Rohan Yadav, Alex Aiken, and Fredrik Kjolstad. *ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis (To Appear)*, 2022.

TACO 2022 Compiler Support for Sparse Tensor Computations in MLIR. Aart J.C. Bik, Penporn Koanantakool, Tatiana Shpeisman, Nicolas Vasilache, Bixia Zheng, and Fredrik Kjolstad. *ACM Transactions on Architecture and Code Optimization*, 2022.

PLDI 2022 DISTAL: The Distributed Tensor Algebra Compiler. Rohan Yadav, Alex Aiken, and Fredrik Kjolstad. *ACM SIGPLAN Conference on Programming Language Design and Implementation*, 2022.

PLDI 2022 Autoscheduling for Sparse Tensor Algebra with an Asymptotic Cost Model. Peter Ahrens, Fredrik Kjolstad, and Saman Amarasinghe. *ACM SIGPLAN Conference on Programming Language Design and Implementation*, 2022.

OOPSLA 2021 Copy-and-Patch Compilation. Haoran Xu and Fredrik Kjolstad. *Proceedings of the ACM on Programming Languages, Volume 5, Issue OOPSLA* (**Distinguished Paper Award**), 2021.

OOPSLA 2021 Compilation of Sparse Array Programming Models. Rawn Henry, Olivia Hsu, Rohan Yadav, Stephen Chou, Kunle Olukotun, Saman Amarasinghe, and Fredrik Kjolstad. *Proceedings of the ACM on Programming Languages, Volume 5, Issue OOPSLA*, 2021.

OOPSLA 2020	A Sparse Iteration Space Transformation Framework for Sparse Tensor Algebra. Ryan Senanayake, Changwan Hong, Ziheng Wang, Amalee Wilson, Stephen Chou, Shoaib Kamil, Saman Amarasinghe, and Fredrik Kjolstad. *Proceedings of the ACM on Programming Languages, Volume 4, Issue OOPSLA*, 2020.
DAC 2020	Rick Bahr, Clark Barrett, Nikhil Bhagdikar, Alex Carsello, Ross Daly, Caleb Donovick, David Durst, Kayvon Fatahalian, Kathleen Feng, Pat Hanrahan, Teguh Hofstee, Mark Horowitz, Dillon Huff, Fredrik Kjolstad, Taeyoung Kong, Qiaoyi Liu, Makai Mann, Jackson Melchert, Ankita Nayak, Aina Niemetz, Gedeon Nyengele, Priyanka Raina, Stephen Richardson, Raj Setaluri, Jeff Setter, Kavya Sreedhar, Maxwell Strange, James Thomas, Christopher Torng, Leonard Truong, Nestan Tsiskaridze, and Keyi Zhang. Creating an Agile Hardware Design Flow. *Design Automation Conference*, 2020.
PLDI 2020	Stephen Chou, Fredrik Kjolstad, and Saman Amarasinghe. Automatic Generation of Efficient Sparse Tensor Format Conversion Routines. *ACM SIGPLAN Conference on Programming Language Design and Implementation*, 2020.
CGO 2019	Fredrik Kjolstad, Peter Ahrens, Shoaib Kamil, and Saman Amarasinghe. Sparse Tensor Algebra Optimization with Workspaces. *International Symposium on Code Generation and Optimization*, 2019.
OOPSLA 2018	Stephen Chou, Fredrik Kjolstad, and Saman Amarasinghe. Format Abstraction for Sparse Tensor Algebra Compilers. *Proceedings of the ACM on Programming Languages, Volume 2, Issue OOPSLA*, 2018.
OOPSLA 2017	Fredrik Kjolstad, Shoaib Kamil, Stephen Chou, David Lugato, and Saman Amarasinghe. The Tensor Algebra Compiler. *Proceedings of the ACM on Programming Languages, Volume 1, Issue OOPSLA* (**Distinguished Paper Award**), 2017.
TOG 2016	Fredrik Kjolstad, Shoaib Kamil Jonathan Ragan-Kelley, David I.W. Levin, Shinjiro Sueda, Desai Chen, Etienne Vouga, Danny M. Kaufman, Gurtej Kanwar, Wojciech Matusik, and Saman Amarasinghe. Simit: A Language for Physical Simulation. *ACM Transactions on Graphics (TOG, presented at SIGGRAPH)*, 2016.
EuroMPI 2013	Timo Schneider, Fredrik Kjolstad, and Torsten Hoefler. MPI Datatype Processing using Runtime Compilation. *The 20th European MPI Users' Group Meeting (EuroMPI)* (**Best Paper Award**), 2013.
ICSE 2011	Fredrik Kjolstad, Danny Dig, Gabriel Acevedo, and Marc Snir. Transformation for Class Immutability. *33rd International Conference on Software Engineering*, 2011.

Short Papers and Workshop Publications

SPAA Brief 2020	Suzanne Mueller, Peter Ahrens, Stephen Chou, Fredrik Kjolstad, and Saman Amarasinghe. Sparse Tensor Transpositions. *ACM Symposium on Parallelism in Algorithms and Architectures (SPAA brief announcement)*, 2020.
AVANCÉES 2018	David Lugato, Fredrik Kjolstad, Stephen Chou, Saman Amarasinghe, and Shoaib Kamil. Taco: compilation et génération de code d'expressions tensorielles. *AVANCÉES No. 12*, 2018.
ASE Tools 2017	Fredrik Kjolstad, Stephen Chou, David Lugato, Shoaib Kamil, and Saman Amarasinghe. 32th IEEE/ACM International Conference on Automated Software Engineering. *taco: A Tool to Generate Tensor Algebra Kernels*, 2017.
TOG Perspective 2016	Gilbert Bernstein, and Fredrik Kjolstad. ACM Transactions on Graphics. *Why New Programming Languages for Simulation?*, 2016.

PPoPP Short 2012	Fredrik Kjolstad, Torsten Hoefler, and Marc Snir. Automatic Datatype Generation and Optimization. *17th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP short paper)*, 2012.
CAP 2010	Fredrik Kjolstad, Danny Dig, and Marc Snir. Bringing the HPC Programmer's IDE into the 21st Century through Refactoring. *SPLASH 2010 Workshop on Concurrency for the Application Programmer*, 2010.
WPPP 2010	Fredrik Kjolstad and Marc Snir. Ghost Cell Pattern. *2nd Annual Workshop on Parallel Programming Patterns*, 2010.

Awards

2022	NSF CAREER Award
2021	Distinguished Paper Award at the Object-Oriented Programming, Systems, Languages & Applications Conference (OOPSLA).
2021	Google Research Scholar
2020	First Place MIT EECS George M. Sprowls PhD Thesis Award in Computer Science
2020	Robert N. Noyce Faculty Fellow, Stanford University School of Engineering
2017	Distinguished Paper Award at the Object-Oriented Programming, Systems, Languages & Applications Conference (OOPSLA).
2016	Adobe Fellowship.
2013	Best Paper Award at the 20th European MPI Users' Group Meeting (EuroMPI).
2011	Best Poster Award from the University of Illinois at Urbana-Champaign Spring Grad Expo.
2006	Rosing Award for best national IT-related student work in 2005 and 2006 from the Norwegian Computer Society.
2005	Eureka Award for best bachelor project from the Norwegian University of Science and Technology in Gjøvik.

Teaching

2020–present	**CS343d Domain-Specific Programming Models and Compilers,** *Stanford University.*
2020–present	**CS143 Compilers,** *Stanford University.*

Service

Program Committees	**PLDI** 2021, 2023 **CGO** 2020, 2022 **PPOPP** 2020, 2021, 2023 **IPDPS** 2023 **SPLASH SRC** 2021 **PLDI SRC** 2020
External Review Committes	**PLDI** 2020 **ASPLOS** 2020
Chairs	**PPoPP 2023** Publications Chair

Journal Reviews	**ACM TACO** 2019, 2021, 2022
	ACM TOMS 2021
	ACM TOPC 2020
	ACM TOG 2017
	IEEE TPDS 2017, 2021
	Springer JPDC 2022

Organizer **Invited Workshop on Compiler Techniques for Sparse Tensor Algebra** (2019)
Invited workshop that brought together leading researchers on sparse tensor algebra compilation and computing from 11 universities, 6 companies and 3 national labs.

Third and fourth MIT Programming Languages Offsite Retreat (2012 and 2013)
Attended by seven CSAIL professors and their research groups. Re-organized program around many short talks, hosted panels, invited external speakers, and gave opening remarks.

Panels **NSF Review Panel** (2021,2022)

PLDI PL Mentoring Workshop (June, 2020)

Invited Talks

Sparse Tensor Algebra Compilation

Aug. 2022	Software and Hardware for Sparse ML. *MLSys Chips & Compilers Symposium,* San Jose, CA.
Jun. 2022	Why you would want a compiler in your sparse library. *NVIDIA,* Virtual Event.
Apr. 2022	Sparse Tensor Algebra Compilation. *Meta PyTorch Team,* Virtual Event.
Oct. 2021	Compiling Sparse Array Programming Languages. *Industry-Academia Partnership MIT/Harvard Cloud Workshop,* Virtual Event
Sep. 2021	Sparse Tensor Algebra Compilation. *Amazon Labs,* Cupertino, CA.
Jul. 2021	Fast Compilation and Sparse Compilation. *Google Brain Hardware,* Virtual Event.
Jun. 2021	Sparse Compilation and Fast Compilation. *Intel Research Overview,* Virtual Event.
Apr. 2021	Sparse Tensor Algebra Compilation. *Mathworks,* Virtual Event.
Mar. 2021	Sparse Tensor Algebra Compilation and Sparse Computation. *Accenture Labs Distinguished Researcher Talk,* Virtual Event.
Jan. 2020	Sparse Tensor Algebra Compilation. *SIAM Conference on Parallel Processing for Scientific Computing, invited talk,* Seattle, WA.
Jan. 2020	Sparse Tensor Algebra Optimization. *SIAM Conference on Parallel Processing for Scientific Computing, invited talk,* Seattle, WA.
Dec. 2019	Tensor Algebra Compilation with Workspaces. *Google Compilers and ML Reading Group,* Virtual Event.
Aug. 2019	The Sparse Tensor Algebra Compiler. *Norwegian University of Science and Technology AI Seminar,* Trondheim, Norway.
Jul. 2019	The Sparse Tensor Algebra Compiler. *MIT Fast Code Seminar*, Cambridge, MA
Jun. 2019	Abstraction without Friction. *NSF Workshop on Future Directions for Parallel and Distributed Computing*, Phoenix, AZ
May 2019	The Sparse Tensor Algebra Compiler. *MIT Graphics Group Seminar*, Cambridge, MA
Apr. 2019	The Sparse Tensor Algebra Compiler. *Cornell CS, Invited Seminar*, Ithaca, NY.
Apr. 2019	The Sparse Tensor Algebra Compiler. *Stanford CS, Invited Seminar*, Stanford, CA.
Mar. 2019	The Sparse Tensor Algebra Compiler. *Georgia Tech CSE, Invited Seminar,* Atlanta, GA.

Feb. 2019	The Sparse Tensor Algebra Compiler. *Innovations in Software Engineering Conference,* Pune, India
Jan. 2019	The Sparse Tensor Algebra Compiler. *UT Austin ECE,* Austin, TX.
Sep. 2018	The Tensor Algebra Compiler. *University of Texas,* Austin, TX.
Jun. 2018	The Sparse Tensor Algebra Compiler. *Adobe Research,* Seattle, WA.
Jun. 2018	The Sparse Tensor Algebra Compiler. *NVIDIA,* Redmond, WA.
Jun. 2018	The Sparse Tensor Algebra Compiler. *University of Washington,* Seattle, WA.
Jun. 2018	The Sparse Tensor Algebra Compiler. *Facebook AI,* Menlo Park, CA.
May 2018	The Sparse Tensor Algebra Compiler. *Stanford,* Stanford, CA.
May 2018	The Sparse Tensor Algebra Compiler. *UC Berkeley,* Stanford, CA.
May 2018	The Sparse Tensor Algebra Compiler. *Google Brain,* Mountain View, CA.
Apr. 2018	The Tensor Algebra Compiler. *Industry-Academia Partnership MIT Cloud Workshop,* Cambridge, MA.
Mar. 2018	The Tensor Algebra Compiler. *SIAM Conference on Parallel Processing for Scientific Computing,* Tokyo, Japan
Nov. 2017	The Tensor Algebra Compiler and Simit. *University of Illinois,* Urbana-Champaign, IL.
Oct. 2017	The Tensor Algebra Compiler. *Microsoft Research,* Redmond, WA.
Sep. 2016	Simit: A Language for Computing on Sparse Systems. *Intel Research*, Hudson, MA.
Aug. 2016	Simit: A Language for Computing on Sparse Systems. *Microsoft Research*, Redmond, WA.
Oct. 2015	Simit: A Language for Computing on Sparse Systems. *MIT Computer Graphics Group Annual Retreat,* Beverly, MA.
Oct. 2008	Performance Optimization of Embedded 3D Graphics Applications. *ARM Developer's Conference,* Santa Clara, CA.

Industry Experience

2007-2009	**ARM Ltd.**, *Graphics Software Engineer.* Developed SDK Tools and OpenGL ES 1.1/2.0 3D Graphics Driver for the ARM Mali GPUs.
2006	**Accenture Technology Solutions**, *Programmer.* Designed parts of the pension web applications for the Norwegian government.