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

ASPLOS	BaCO: A Fast and Portable Bayesian Compiler Optimization Framework. BaCO: A Fast and Portable Bayesian Compiler Optimization Framework Erik Hellsten, Artur Souza, Johannes Lenfers, Rubens Lacouture, Olivia Hsu, Adel Ejjeh, Fredrik Kjolstad, Michel Steuwer, Kunle Olukotun, and Luigi Nardi. *International Conference on Architectural Support for Programming Languages and Operating Systems (to appear)*, 2024.
SC	Legate Sparse: Distributed Sparse Computing in Python. Rohan Yadav, Wonchan Lee, Melih Elibol, Manolis Papadakis, Taylor Lee-Patti, Michael Garland, Alex Aiken, Fredrik Kjolstad, and Michael Bauer. *ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis*, 2023.
PLDI	Indexed Streams: A Formal Intermediate Representation for the Fused Execution of Contraction Operations. Scott Kovach, Praneeth Kolichala, Timothy Guo, and Fredrik Kjolstad. *ACM SIGPLAN Conference on Programming Language Design and Implementation*, 2023.
PLDI	Mosaic: An Interoperable Compiler for Tensor Algebra. Manya Bansal, Olivia Hsu, Kunle Olukotun, and Fredrik Kjolstad. *ACM SIGPLAN Conference on Programming Language Design and Implementation* (**Distinguished Paper Award**), 2023.
ASPLOS	The Sparse Abstract Machine. Olivia Hsu, Maxwell Strange, Ritvik Sharma, Jaeyeon Won, Kunle Olukotun, Joel Emer, Mark Horowitz, and Fredrik Kjolstad. *Architectural Support for Programming Languages and Operating Systems*, 2023.

TACO	Unified Buffer: Compiling Image Processing and Machine Learning Applications to Push-Memory Accelerators. Qiaoyi Liu, Jeff Setter, Dillon Huff, Maxwell Strange, Kathleen Feng, Mark Horowitz, Priyanka Raina, and Fredrik Kjolstad. *ACM Transactions on Architecture and Code Optimization (TACO)*, 2023.
TECS	Aha: An agile approach to the design of coarse-grained reconfigurable accelerators and compilers. Kalhan Koul, Jackson Melchert, Kavya Sreedhar, Leonard Truong, Gedeon Nyengele, Keyi Zhang, Qiaoyi Liu, Jeff Setter, Po-Han Chen, Yuchen Mei, Maxwell Strange, Ross Daly, Caleb Donovick, Alex Carsello, Taeyoung Kong, Kathleen Feng, Dillon Huff, Ankita Nayak, Raj Setaluri, James Thomas, Nikhil Bhagdikar, David Durst, Zachary Myers, Nestan Tsiskaridze, Stephen Richardson, Rick Bahr, Kayvon Fatahalian, Pat Hanrahan, Clark Barrett, Mark Horowitz, Christopher Torng, Fredrik Kjolstad, and Priyanka Raina. *ACM Transactions on Embedded Computing Systems*, 2023.
CGO	Looplets: A Language For Structured Coiteration. Willow Ahrens, Daniel Donenfeld, Fredrik Kjolstad, and Saman Amarasinghe. *International Symposium on Code Generation and Optimization (accepted)*, 2023.
SC	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*, 2022.
TACO	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	DISTAL: The Distributed Tensor Algebra Compiler. Rohan Yadav, Alex Aiken, and Fredrik Kjolstad. *ACM SIGPLAN Conference on Programming Language Design and Implementation*, 2022.
PLDI	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	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	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	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	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	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	Fredrik Kjolstad, Peter Ahrens, Shoaib Kamil, and Saman Amarasinghe. Sparse Tensor Algebra Optimization with Workspaces. *International Symposium on Code Generation and Optimization*, 2019.
OOPSLA	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	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	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	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	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	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	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	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	Gilbert Bernstein, and Fredrik Kjolstad. ACM Transactions on Graphics. *Why New Programming Languages for Simulation?*, 2016.
PPoPP Short	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	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	Fredrik Kjolstad and Marc Snir. Ghost Cell Pattern. *2nd Annual Workshop on Parallel Programming Patterns*, 2010.

Awards

2023	Distinguished Paper Award, PLDI
2022	NSF CAREER Award
2021	Distinguished Paper Award, 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, OOPSLA.
2016	Adobe Fellowship.
2013	Best Paper Award, 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	ASPLOS 2024 Program Committee
	OOPSLA 2024 Review Committee
	CC 2024 Program Committee
	PLDI 2023 Program Committee
	PPOPP 2023 Program Committee
	IPDPS 2023 Program Committee
	CGO 2022 Program Committee
	PPOPP 2021 Program Committee
	PLDI 2021 Program Committee
	SPLASH 2021 Student Research Competition Committee 2021
	PPOPP 2020 Program Committee
	CGO 2020 Program Committee
	PLDI Student Research Competition Committee 2020
	PLDI External Review Committes 2020
	ASPLOS External Review Committes 2020
Chairs	**PLDI 2024** Sponsorship co-chair
	PPoPP 2023 Publications chair
Journal and External Reviews	**ACM TACO** 2019, 2021, 2022
	ACM TOMS 2021
	ACM TOPC 2020
	ACM TOG 2017
	ACM SIGGRAPH Asia 2023
	NeurIPS 2023
	IEEE Computer Architecture Letters 2022, 2023
	IEEE TPDS 2017, 2021
	Springer JPDC 2022

Organizer	**Second Workshop on Compiler Techniques for Sparse Tensor Algebra** (2023) Workshop that brought together leading researchers on sparse tensor algebra compilation and computing. Colocated with PLDI 2023.
	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

Oct. 2023	Hardware/Software Codesign For Sparse Neural Networks, *Meta AI & Systems Co-design Faculty Summit:* Menlo Park, CA.
Sep. 2023	Software and Hardware for Sparse ML. *CODAI Workshop,* Virtual Talk.
Jun. 2023	Portable Compilation for Sparse Computation. *PLDI DRAGSTERS Workshop Keynote,* Orlando, FL.
Jun. 2023	Software and Hardware for Sparse ML. *PLDI CTSTA Workshop,* Orlando, FL.
Apr. 2023	Portable Compilation for Sparse Computation. *Rice Future of Large-Scale Machine Learning Workshop Invited Talk,* Houston, TX.
Nov. 2022	Sparse Tensor Algebra Compilation Tutorial. *NVIDIA,* Virtual Event.
Oct. 2022	Portable Compilation for Sparse Computation. *UC Berkeley Sky Seminar,* Berkeley, CA.
Oct. 2022	Software and Hardware for Sparse ML. *Meta AI HW/SW Codesign Team,* Menlo Park, CA.
Oct. 2022	Portable Compilation of Sparse Computation. *LCPC Inited Talk,* Chicago, IL.
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,* Menlo Park, CA.
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.
Oct. 2019	Optimization in the Sparse Tensor Algebra Compiler. *LCPC Invited Talk,* Atlanta, GA.
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, Invited Talk,* 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.

PhD Students

James Dong
Olivia Hsu (co-advised with Kunle Olukotun)
Scott Kovach
Rubens Lacouture (co-advised with Kunle Olukotun)
Alexander Root
Shiv Sundram
Haoran Xu
Rohan Yadav (co-advised with Alex Aiken)
Bobby Yan

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.