Fredrik Berg Kjoelstad

Assistant Professor, Computer Science

Stanford University
353 Jane Stanford Way, 440
Stanford, CA 94305-9040
217-417-9083
kjolstad@cs.stanford.edu
www.fredrikbk.com

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

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

2. 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 (PLDI to appear)*, 2022.

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

4. 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.

5. 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.

6. 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 (DAC)*, 2020.

7. 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 (PLDI)*, 2020.

8. Fredrik Kjolstad, Peter Ahrens, Shoaib Kamil, and Saman Amarasinghe. Sparse Tensor Algebra Optimization with Workspaces. *International Symposium on Code Generation and Optimization (CGO)*, 2019.

9. 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.

10. 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.

11. 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.

12. 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.

13. 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

14. 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.

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

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

17. Gilbert Bernstein, and Fredrik Kjolstad. ACM Transactions on Graphics (TOG perspective paper). *Why New Programming Languages for Simulation?*, 2016.

18. 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.

19. 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 (CAP)*, 2010.

20. 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

Fall 2021	**CS343d Domain-Specific Programming Models and Compilers,** *Stanford University.*
Spring 2021	**CS143 Compilers,** *Stanford University.*
Fall 2020	**CS343d Domain-Specific Programming Models and Compilers,** *with Pat Hanrahan, Stanford University.*
Spring 2020	**CS143 Compilers,** *Stanford University.*

Service

Program Committee	**PLDI 2021** Program Committee
	CGO 2020, 2022 Program Committee
	PPOPP 2020, 2021 Program Committee
	SPLASH SRC 2021 Program Committee
	PLDI 2020 External Review Committee
	ASPLOS 2020 External Review Committee
	PLDI 2020 SRC Program Committee
Journal Review	**ACM Transactions on Mathematical Software** (TOMS) 2021
	ACM Transactions on Parallel Computing (TOPC) 2020
	ACM Transactions on Architecture and Code Optimization (TACO) 2019, 2021
	ACM Transactions on Graphics (TOG 2017)
	IEEE Transactions on Parallel and Distributed Systems (TPDS 2017, 2021)

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

Panelist	**NSF Review Panel** (2021,2022)
Panelist	**PLDI PL Mentoring Workshop** (June, 2020)
Panelist	**ADA Fall Symposium panel on Agile Systems Design** (Oct. 2018) With Julian Shun, Baris Kasikci and Sharad Malik, moderated by Zachary Tatlock.

Talks

Misc Talks

Mar. 2021	Stanford CS349e Guest Lecture on Sparse Computation and Accelerator Hardware
Dec. 2019	NSF SPX Workshop on Abstraction without Friction
Aug. 2019	NTNU TDT4200 Guest Lecture on Parallel Computing
Jun. 2019	NSF Workshop on Future Directions for Parallel and Distributed Computing Short Talk on Abstraction Without Friction
Sep. 2016	MIT 6.172 Lecture on Introduction to C
Nov. 2014	Harvard CS207 Guest Lecture on Graphs, Matrices, and Compilers

Sparse Tensor Algebra Compilation

Mar. 2021	Accenture Labs Distinguished Researcher Talk
Jan. 2020	SIAM PP on Sparse Tensor Algebra Compilation
Jan. 2020	SIAM PP on Sparse Tensor Algebra Optimization
Dec. 2019	Google Compilers and ML Reading Group on Tensor Algebra Compilation with Workspaces
Aug. 2019	NTNU AI Seminar, Invited Talk
Jul. 2019	MIT Fast Code Seminar, Invited Talk
May 2019	MIT Graphics Group Seminar, Invited Talk
Apr. 2019	ADA e-workshop
Apr. 2019	Cornell, Invited Seminar
Apr. 2019	Stanford, Invited Seminar
Mar. 2019	Georgia Tech CSE, Invited Seminar
Feb. 2019	International Symposium on Code Generation and Optimization (CGO), Washington DC
Feb. 2019	Innovations in Software Engineering Conference, India, Invited Talk
Jan. 2019	UT Austin ECE, Invited Seminar
Nov. 2018	Key Presentation in DARPA Review
Nov. 2018	ADA Liaison Meeting Talk
Sep. 2018	University of Texas, Austin
Sep. 2018	Semiconductor Research Corporation TECHCON, Austin
Jun. 2018	Adobe Research, Seattle
Jun. 2018	NVIDIA, Redmond
Jun. 2018	University of Washington

Jun. 2018	Facebook AI, Menlo Park
May 2018	Stanford
May 2018	UC Berkeley
May 2018	Google Brain, Mountain View
Apr. 2018	Industry-Academia Partnership MIT Cloud Workshop, Invited Talk
Mar. 2018	SIAM Parallel Processing for Scientific Computing, Tokyo, Invited Talk
Jan. 2018	SciDAC4 Kickoff Meeting, Thomas Jefferson National Accelerator Facility
Nov. 2017	University of Illinois, Urbana-Champaign
Nov. 2017	Automated Software Engineering Tools Track (ASE)
Oct. 2017	Object-Oriented Programming, Systems, Languages, and Analysis (OOPSLA)
Oct. 2017	Microsoft Research, Redmond
Apr. 2017	MIT 6.S898 Guest Lecture

Simit: A Language for Computing on Sparse Systems

Sep. 2016	Intel Research, Hudson
Aug. 2016	Microsoft Research, Redmond
Jul. 2016	ACM Special Interest Group on Graphics (SIGGRAPH)
Oct. 2015	MIT Computer Graphics Group Annual Retreat
May 2015	MIT Programming Languages Offsite

Transformation for Class Immutability

May 2011	33rd International Conference on Software Engineering
Apr. 2011	UPCRC Illinois Summit

Refactoring for High-Performance Computing

Oct. 2010	SPLASH Workshop on Concurrency for the Application Programmer

Performance Optimization of Embedded 3D Graphics Applications

Oct. 2008	ARM Developer's Conference, Santa Clara, Invited Talk

Industry and Government 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.
2005–2006	**Norwegian Army**, *Engineer.* Mandatory conscripted military service in the Norwegian Engineering Battalion.