

Christopher Musco

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Academic Positions

Princeton University

Research Instructor, Department of Computer Science

Princeton, MA

2018 – present

Massachusetts Institute of Technology

Research Assistant, Theory of Computation Group

Cambridge, MA

2013 – 2018

Yahoo Labs

Summer Research Intern, Scalable Machine Learning Group

New York, NY

2015

Research Areas

foundations of data science • scalable machine learning • numerical linear algebra • theory of algorithms
dimensionality reduction • sketching and streaming • algorithmic graph theory • optimization

Education

Massachusetts Institute of Technology

Ph.D. Computer Science – Theory of Computation

Advisor: Jonathan Kelner

Thesis: “Faster Linear Algebra for Data Analysis and Machine Learning”

Cambridge, MA

2013 – 2018

Yale University

B.S. Applied Mathematics, B.S. Computer Science

Applied Mathematics Thesis: Fast Discrete Laplace Transforms (with Vladimir Rokhlin)

Computer Science Thesis: Graph Constructions for Machine Learning (with Daniel Spielman)

New Haven, CT

2008 – 2012

Publications

Authors appear in alphabetical order, in the tradition of mathematics and theoretical computer science.

[Eigenvector Computation and Community Detection in Asynchronous Gossip Models](#). Frederik Mallmann-Trenn, Cameron Musco, Christopher Musco. *International Colloquium on Automata, Languages, and Programming (ICALP)* 2018.

[Minimizing Polarization and Disagreement in Social Networks](#). Cameron Musco, Christopher Musco and Charalampos Tsourakakis. *The Web Conference (WWW)* 2018.

[Stability of the Lanczos Method for Matrix Function Approximation](#). Cameron Musco, Christopher Musco, Aaron Sidford. *ACM-SIAM Symposium on Discrete Algorithms (SODA)* 2018.

[Recursive Sampling for the Nyström Method](#). Cameron Musco, Christopher Musco. *Conference on Neural Information Processing Systems (NIPS)* 2017.

[Random Fourier Features for Kernel Ridge Regression: Approximation Bounds and Statistical Guarantees](#). Haim Avron, Michael Kapralov, Cameron Musco, Christopher Musco, Ameya Velingker, Amir Zandieh. *International Conference on Machine Learning (ICML)* 2017.

[Input Sparsity Time Low-Rank Approximation via Ridge Leverage Score Sampling](#). Michael B. Cohen, Cameron Musco, Christopher Musco. *ACM-SIAM Symposium on Discrete Algorithms (SODA)* 2017.

Determining Tournament Payout Structures for Daily Fantasy Sports. Christopher Musco, Maxim Sviridenko, Justin Thaler. *SIAM Algorithm Engineering and Experiments (ALENEX)* 2017.

Principal Component Projection Without Principal Component Analysis. Roy Frostig, Cameron Musco, Christopher Musco, Aaron Sidford. *International Conference on Machine Learning (ICML)* 2016.

Randomized Block Krylov Methods for Stronger and Faster Approximate Singular Value Decomposition. Cameron Musco, Christopher Musco. *Conference on Neural Information Processing Systems (NIPS)* 2015. Invited for full oral presentation (1 of 15 out of 403 accepted papers). Also presented at the 2016 Copper Mountain Conference on Iterative Methods

Dimensionality Reduction for K-Means Clustering and Low Rank Approximation. Michael B. Cohen, Samuel Elder, Cameron Musco, Christopher Musco, Madalina Persu. *ACM Symposium on Theory of Computing (STOC)* 2015.

Principled Sampling for Anomaly Detection. Brendan Juba, Fan Long, Christopher Musco, Stelios Sidiropoulos-Douskos, Martin Rinard. *Network and Distributed System Security Symposium (NDSS)* 2015.

Uniform Sampling for Matrix Approximation. Michael B. Cohen, Yin Tat Lee, Cameron Musco, Christopher Musco, Richard Peng, Aaron Sidford. *Innovations in Theoretical Computer Science (ITCS)* 2015.

Single Pass Spectral Sparsification in Dynamic Streams. Michael Kapralov, Yin Tat Lee, Cameron Musco, Christopher Musco, Aaron Sidford. *IEEE Symposium on Foundations of Computer Science (FOCS)* 2014, Special Issue SIAM Journal on Computing 2017.

Other.....

Learning Networks from Random Walk-Based Node Similarities. Jeremy Hoskins, Cameron Musco, Christopher Musco, Charalampos Tsourakakis. *In submission.* 2018.

Teaching

Advanced Algorithm Design (Princeton COS 521)

Instructor *Fall 2018*

Advanced Algorithms (MIT 6.854/18.415)

Teaching Assistant *Spring 2016*

Technical Communication Skills for Graduate Students (MIT 6.S977)

Workshop Leader *Spring 2016*

Introduction to Computer Science (Yale CPSC-201)

Teaching Assistant *Spring 2012*

Introduction to Programming (Yale CPSC-112)

Teaching Assistant *Fall 2011*

Mentorship and Outreach

MIT Graduate Communication Lab

Communication Advisor *2015 – 2018*

Helped to establish an EECS Communication Lab to provide over 700 graduate students with support in academic writing, oral presentation, job applications, and generally, in communicating effectively. Offered feedback, guidance, and coaching to individual students during weekly office hours (100+ individual appointments).

CSAIL Algorithms Office Hours

Member *2016 – 2018*

Advised researchers, generally in applied fields, on framing and solving algorithmic problems in their research.

Research Science Institute at MIT

Summer Research Advisor *2014*

Primary supervisor for Christopher Wang, a high school student participating in the prestigious RSI summer program. Chris's project, "Relaxation of a Concurrent Disjoint-Set", was selected as one of 10 program finalists.

Talks and Presentations

The Lanczos Method in Data Science: Challenges and Opportunities

Georgetown University, CS Seminar *Feb. 2018*

Symposium on Discrete Algorithms (SODA) *Jan. 2018*

Unifying Random Fourier Features and Leverage Scores for Kernel Matrix Approximation

Institute for Advanced Study, Computer Science and Discrete Mathematics Seminar *Feb. 2018*

Harvard University, guest lecture in "Sketching Algorithms for Big Data" *Nov. 2017*

Microsoft Research, Redmond *Sept. 2017*

Sketching and Sampling Methods for Large Scale Linear Algebra

Twitter, Cambridge *July 2017*

Recursive Sampling for the Nyström Method

Neural Information Processing Systems (NIPS) poster session *Dec. 2017*

New England Machine Learning Day poster session *May 2017*

Algorithms for Determining Tournament Payout Structures

Meeting on Algorithm Engineering and Experiments (ALENEX) *Jan. 2017*

Introduction to Linear Sketching

MIT, Theory Retreat *Sept. 2016*

Principal Component Projection without Principal Component Analysis

International Conference on Machine Learning (ICML) *June 2016*

Ridge Leverage Score Sampling

National Institute of Informatics, Shonan Meeting *July 2016*

MIT, Algorithms & Complexity Seminar *July 2016*

University of Utah, Data Group Meeting *Jan. 2016*

Randomized Block Krylov Methods

Neural Information Processing Systems (NIPS) poster session *Dec. 2015*

Large Scale Column Subset Selection

Yahoo Labs, Science Week poster session *July 2015*

Dimensionality Reduction for k-Means Clustering

IBM T.J. Watson, Mathematical Sciences research seminar *Aug. 2015*

Symposium on Theory of Computing (STOC) *June 2015*

MIT, Theory Lunch *June 2014*

Principled Sampling for Anomaly Detection

MIT, Defense Advanced Research Projects Agency site visit *Mar. 2015*

Network and Distributed System Security Symposium (NDSS) *Feb. 2015*

Uniform Sampling for Matrix Approximation

Yahoo Labs, Scalable Machine Learning research seminar *June 2015*

Single Pass Spectral Sparsification in Dynamic Streams

MIT, Annual Sublinear Algorithms Day poster session *Apr. 2015*

Harvard University, Theory Seminar
Foundations of Computer Science (FOCS)

Nov. 2014
Oct. 2014

Service

Conference Reviewer.....

COLT (2016, 2018), ESA (2015, 2017), FOCS (2015,2018), ICALP (2015, 2017, 2018), ITCS (2018), IWOCA (2018), NIPS (2015, 2016, 2017, 2018), NDSS (2015), RANDOM (2017,2018), STACS (2018), SODA (2016, 2017, 2018), WALCOM (2018)

Journal Reviewer.....

Advances in Data Analysis and Classification (2018), IEEE Transactions on Knowledge and Data Engineering (2017), IEEE Transactions on Signal Processing (2016, 2017, 2018), Journal of Machine Learning Research (2018), Mathematical Programming (2018), SIAM Journal on Matrix Analysis and Applications (2016, 2017)

Program Committee.....

ICML 2018 (non-organizational reviewer)

Other Research Experience

Japan National Institute of Informatics

Invited participant

2016

Shonan meeting on Recent Advances in Randomized Numerical Linear Algebra.

Honors and Awards

National Science Foundation

2014-2017

Graduate Research Fellowship, recipient.

Yale University

2012

Cum Laude, Distinction in Both Majors.

Other Professional Experience

Redfin

Seattle, WA

Software Engineer, Data Team

2012 – 2014

Developed backend Java infrastructure for internet-powered real estate startup. Incorporated large-scale machine learning algorithms into production code. Managed three interns and onboarded four new-hires.

Elysium Digital

Cambridge, MA

Summer Consultant

2011

Provided technical expertise in software patent cases at leading litigation consulting company.

Amicus

New Haven, CT

Software Developer

2010 – 2011

Built applications for political campaign management and social fundraising at an early-stage startup that went on to raise nearly 4 million dollars in seed funding.