

Cameron Musco

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Education

Massachusetts Institute of Technology

Ph.D. Candidate, Computer Science – Theoretical Computer Science

Advisor: Nancy Lynch

S.M. Thesis: Dimensionality Reduction for k -Means Clustering (September 2015)

Cambridge, MA

2013 – present

Yale University

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

Computer Science Thesis:

Graph Construction Through Laplacian Function Optimization (advised by Daniel Spielman)

Applied Mathematics Thesis:

Fast Approximation of Maximum Flow Using Electrical Flows (advised by Daniel Spielman)

New Haven, CT

2008 – 2012

Research Interests

I study algorithms, focusing on randomized linear algebra, data analysis, and optimization. I am interested in modern computational settings, such as distributed and streaming data processing. Additionally, I am interested in better understanding randomization and algorithmic robustness by studying distributed algorithms that arise in biological systems.

Conference Publications

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)* 2016.

Online Row Sampling. Michael B. Cohen, Cameron Musco, Jakub Pachocki. *International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX)* 2016.

Ant-Inspired Density Estimation via Random Walks. Cameron Musco, Hsin-Hao Su, Nancy Lynch. *Principles of Distributed Computing (PODC)* 2016.

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

Faster Eigenvector Computation via Shift-and-Invert Preconditioning. Elad Hazan, Daniel Garber, Chi Jin, Sham M. Kakade, Cameron Musco, Praneeth Netrapalli, 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. *Neural Information Processing Systems (NIPS)* 2015. Full oral presentation (1 of 15 out of 403 papers).

Distributed House-Hunting in Ant Colonies. Mohsen Ghaffari, Cameron Musco, Tsvetomira Radeva, Nancy Lynch. *Principles of Distributed Computing (PODC)* 2015.

Dimensionality Reduction for k -Means Clustering and Low Rank Approximation. Michael B. Cohen, Samuel Elder, Cameron Musco, Christopher Musco, Madalina Persu. *Symposium on Theory of Computing (STOC)* 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. *Foundations of Computer Science (FOCS)* 2014. Invited to Special Issue of SICOMP.

Submitted Manuscripts

Provably Useful Kernel Matrix Approximation in Linear Time. Cameron Musco, Christopher Musco. 2016.

Computational Tradeoffs in Biological Neural Networks: Self-Stabilizing Winner-Take-All Networks. Nancy Lynch, Cameron Musco, and Merav Parter. 2016.

Talks and Presentations

Computational Tradeoffs in Biological Neural Networks: Self-Stabilizing WTA

MIT Theory of Distributed Systems Seminar *Oct. 2016*

Fast Low-Rank Approximation and PCA: Beyond Sketching

Invited Talk, Algorithms for Modern Massive Data Sets (MMDS) *Jun. 2016*

Invited Talk, NII Shonan Meeting on Recent Advances in RandNLA *Jul. 2016*

Ant-Inspired Density Estimation via Random Walks

MIT Theory of Distributed Systems Seminar *Apr. 2016*

MIT Theoretical Computer Science Group Theory Lunch *Feb. 2016*

Randomized Block Krylov Methods for Stronger and Faster Approximate SVD

Copper Mountain Conference on Iterative Methods *Mar. 2016*

University of Utah Data Group Meeting *Jan. 2016*

Neural Information Processing Systems (NIPS) Oral Session *Dec. 2015*

MIT Theoretical Computer Science Group Theory Lunch *Aug. 2015*

Chebyshev Polynomials and Approximation Theory in Theoretical Computer Science

Invited Talk, MIT Danny Lewin Theory Retreat *Oct. 2015*

Dimensionality Reduction and Linear Sketching for Large Scale Data Analysis

CSAIL Alliance Program Annual Meeting, Poster Session *Jun. 2015*

Distributed House-Hunting in Ant Colonies

University of Arizona Social Insect Lab *Jun. 2015*

Dimensionality Reduction for k -Means Clustering

MIT Algorithms and Complexity Seminar *Apr. 2015*

Single Pass Spectral Sparsification in Dynamic Streams

CSoI NSF Site Visit, Purdue University, Poster Session *Dec. 2014*

Uniform Sampling for Matrix Approximation

MIT Algorithms and Complexity Seminar *Nov. 2014*

Linear Sketching and Applications to Distributed Computation

MIT Theory of Distributed Systems Seminar *Nov. 2014*

Sparse Recovery Based Sketching for Streaming and Distributed Graph Algorithms

MIT Theoretical Computer Science Group Theory Lunch *Jun. 2014*

Teaching Experience

Massachusetts Institute of Technology

Teaching Assistant. 6.852: Distributed Algorithms.

Fall 2015

Yale University

Teaching Assistant. CS 202: Mathematical Tools for Computer Science.

Fall 2010

Service

External Reviewer

Symposium on Discrete Algorithms (SODA)	2017
Expert Systems: The Journal of Knowledge Engineering	2016
Computational and Applied Mathematics (COAM)	2016
Neural Information Processing Systems (NIPS)	2016
Conference on Learning Theory (COLT)	2016
Int'l Colloquium on Structural Info. and Comm. Complexity (SIROCCO)	2016
Int'l Colloquium on Automata, Languages and Programming (ICALP)	2016
Symposium on Parallelism in Algorithms and Architectures (SPAA)	2016
Symposium on Principles of Distributed Computing (PODC)	2016
SIAM Journal on Matrix Analysis and Applications (SIMAX)	2015
Foundations of Computer Science (FOCS)	2015
International Symposium on Distributed Computing (DISC)	2015
Biological Distributed Algorithms (BDA)	2015

Honors and Awards

National Science Foundation

Graduate Research Fellowship.

2014-Present

Yale University

Summa Cum Laude, Phi Beta Kappa, Computer Science Senior Prize.

2012

Other Research Experience

NII Shonan Meeting on Recent Advances in Randomized Linear Algebra

Invited participant.

2015

SIAM G2S3 Summer School on Randomization in Numerical Linear Algebra

Attendee.

2015

Industry Experience

IBM Research – Almaden

Research Intern (Mentor: David Woodruff)

San Jose, CA

Summer 2016

Worked in IBM's Theory Group, studying low-rank approximation of positive semidefinite matrices, computational lower bounds for linear algebraic problems, and randomized methods for matrix norm approximation.

Redfin

Software Developer, Data Team

Seattle, WA

2012 – 2014

Helped lead integration of large-scale data analytics with customer facing website. Expanded and improved infrastructure for importing, validating, and analyzing real estate listings, property records, and region data.

Elysium Digital

Summer Technical Litigation Consultant

Cambridge, MA

Summer 2011

Analyzed source code, researched prior art, and provided technical expertise for intellectual property lawsuits.

Amicus*Software Developer*

Developed first release of outreach and fundraising software for political campaigns and non-profits. Focused on general development as well as machine learning algorithms, including the automatic generation of efficient door-to-door canvassing schedules.

New Haven, CT*2010 – 2011***Moody's Investors Service***Intern, Public Finance Group*

Analyzed financial reports and bond prospectuses to develop municipal security credit ratings.

New York, NY*Summer 2009***Rhode Island Natural Resources Conservation Service***Intern*

Performed field research, mapped soil types, and investigated invasive plant growth.

East Greenwich, RI*Summer 2007*