Lorenzo Orecchia

Contact Information

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Research Interests

Iterative Algorithms, Convex Optimization, Numerical Analysis, Machine Learning

Academic Positions

Boston University, Boston, MA
Assistant Professor, Computer Science Department 1/2015 – Present

Massachusetts Institute of Technology, Cambridge, MA
Applied Mathematics Instructor, Department of Mathematics 9/2011 – 12/2014
Mentor: Jonathan Kelner

Education

University of California, Berkeley CA
Ph.D., Computer Science, May 2011
Advisor: Satish Rao
Dissertation: Fast Approximation Algorithms for Graph Partitioning Using Spectral and Semidefinite-Programming Techniques

Princeton University, Princeton, NJ
A.B. summa cum laude, Computer Science, May 2005

Awards and Grants

Hariri Institute for Computing Junior Faculty Fellow 2015-2018

PI for NSF AF Grant *New Perspectives on Spectral Methods for Graph Algorithms* (CCF 1319460)

Co-winner of Best Paper Award at SODA 2014

Publications

- Z.Allen-Zhu and L.Orecchia. *Linear Coupling of Gradient and Mirror Descent.* To appear in **ITCS'17**, 2017.
- Z.Allen-Zhu, A.Bhaskara, S.Lattanzi, V.Mirrokni and L.Orecchia. *Expanders Using Local Edge Flips.* **SODA'16**: ACM-SIAM Proc. Symp. Discrete Algorithms, pp. 269–279, 2016.
- Z.Allen-Zhu, Y.T.Lee and L.Orecchia. *Using Optimization to Obtain a Width-Independent, Parallel, Simpler, and Faster Positive SDP Solver.* **SODA'16**: ACM-SIAM Proc. Symp. Discrete Algorithms, pp. 1824–1831, 2016.
- Z.Allen-Zhu, Z.Liao and L.Orecchia. *Linear-Sized Spectral Sparsification in Almost Quadratic Time and Regret Minimization Beyond Matrix Multiplicative Weight Updates.* **STOC'15**: ACM Proc. Symp. Theory Computing, pp. 237–245, 2015.
- Z.Allen-Zhu and L.Orecchia. *Nearly-Linear Time Packing and Covering LP Solver with Faster Convergence Rate Than $O(1/\epsilon^2)$.* **STOC'15**: ACM Proc. Symp. Theory Computing, pp. 229–236, 2015
- J.A.Kelner, L.Orecchia, Y.T.Lee and A.Sidford. *An Almost-Linear-Time Algorithm for Approximate Max Flow in Undirected Graphs, and its Multicommodity Generalizations.* **SODA'14**: ACM-SIAM Proc. Symp. Discrete Algorithms, pp. 217–226, 2014. **Co-winner of best paper award. Invited to J. ACM.**
- Z.Allen-Zhu and L.Orecchia. *Flow-Based Algorithms for Local Graph Clustering.* **SODA'14**: ACM-SIAM Proc. Symp. Discrete Algorithms, pp. 1267–1286, 2014.

- Z.Allen-Zhu, J.A.Kelner, L.Orecchia and A.Sidford. *A simple, combinatorial algorithm for solving SDD systems in nearly-linear time.* **STOC'13**: ACM Proc. Symp. Theory Computing, pp. 911–920, 2013.
- R.P.Smith, S.J.Riesenfeld, A.K.Holloway, Q.Li, K.K.Murphy, N.M.Feliciano, L.Orecchia, N.Oksenberg, K.S.Pollard and N.Ahituv. *A compact, in vivo screen of all 6-mers reveals drivers of tissue-specific expression and guides synthetic regulatory element design.* **Genome Biology**, 14:R72, 2013.
- L.Orecchia, S.Sachdeva and N.K.Vishnoi. *Approximating the Exponential, the Lanczos Method and an $\tilde{O}(m)$-Time Spectral Algorithm for Balanced Separator.* **STOC'12**: ACM Proc. Symp. Theory Computing, pp. 1141–1160, 2012.
- M.W.Mahoney, L.Orecchia and N.K.Vishnoi. *Spectral Algorithms to Explore Graphs in a Local Manner.* **J. Machine Learning Research**, 13, 2339–2365, 2012.
- L.Orecchia and N.K.Vishnoi. *Towards an SDP-Based Approach to Spectral Methods: A Nearly-Linear Time Algorithm for Graph Partitioning and Decomposition.* **SODA'11**: ACM-SIAM Proc. Symp. Discrete Algorithms, pp. 532–545, 2011.
- M.W.Mahoney and L.Orecchia. *Implementing Regularization Implicitly via Approximate Eigenvector Computation.* **ICML'11**: Proc. Intl. Conf. Machine Learning, pp. 121–128, 2011.
- K.J.Lang, M.W.Mahoney and L.Orecchia. *Empirical Evaluation of Graph Partitioning Using Spectral Embeddings and Flow.* **SEA'09**: Proc. Intl. Symp. Experimental Algorithms, pp. 197–208, 2009.
- L.Orecchia, L.Schulman, U.V.Vazirani and N.K.Vishnoi. *On Partitioning Graphs via Single Commodity Flows.* **STOC'08**: ACM Proc. Symp. Theory of Computing, pp. 461–470, 2008.
- D.Dubhashi, O.Häggström, L.Orecchia, A.Panconesi, C.Petrioli and A.Vitaletti. *Localized Techniques for Broadcasting in Wireless Sensor Networks.* **Algorithmica,** 49–4, pp. 412–446, 2007.
- L.Orecchia, A.Panconesi, C.Petrioli and A.Vitaletti. *Localized Techniques for Broadcasting in Wireless Sensor Networks.* **DIALM-POMC'04**: Joint Workshop Foundations Mobile Computing, p. 41–51, 2004.
- A.Cavalcanti, T.Doak, L.Landweber, L.Orecchia and N.Stover. *Coding Properties of Oxytricha trifallax* (Sterkiella histriomuscorum) *Macronuclear Chromosomes: Analysis of a Pilot Genome Project.* **Chromosoma**, 113–2, pp. 69–76, 2004.

Teaching

Instructor, Boston University
"CS591: Iterative Methods for Graph Algorithms" Spring 2015, Fall 2016
"CS131: Combinatoric Structures" Fall 2015

Instructor, MIT
"18.310C: Principles of Discrete Applied Mathematics" Fall 2012, 2013
Developed communication-intensive class with M.X.Goemans, S.Ruff and P.Shor.
"18.434: Undegraduate Seminar in Theoretical Computer Science" Spring 2013, 2014

Professional Service and Outreach

"Messaggeri della Conoscenza 2013": Taught a summer school in Bari, Italy, as part of a governement program aiming to expose undergraduates in underdeveloped regions of Italy to teaching methods from internationally recognized universities.

Program Committees: ICALP 2016, SODA 2017.

Organizer of semester-long program "Bridging Continuous and Discrete Optimization" at the Simons Institute for Theoretical Computer Science, to run in Fall 2017.