Lorenzo Orecchia

CONTACT INFORMATION	Department of Computer Science The University of Chicago 5730 S Ellis Ave, Rm 315 Chicago, IL 60637 USA	*Phone:* (773) 702-2356 *Fax:* (773) 702-8487 *Email:* orecchia@uchicago.edu *Web:* http://orecchia.net

RESEARCH INTERESTS

Convex Optimization, Spectral Methods, Graph Algorithms, Machine Learning

ACADEMIC POSITIONS

The University of Chicago, Chicago, IL
Assistant Professor, Department of Computer Science   7/2019 – Present

Boston University, Boston, MA
Assistant Professor, Department of Computer Science   1/2015 – 6/2019

POSTDOCTORAL POSITIONS

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, 5/2011
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, 5/2005

HONORS AND AFFILIATIONS

NSF CAREER Award 2020

Co-winner of Best Paper Award at SODA 2014

GRANTS

PI for NSF CAREER Award *Next-Generation Design of First-Order Optimization Algorithms by the Calculus of Variations of Self-Dual Functionals* (CCF 1943510), 2020-2024

PI for NSF AF Grant *Continuous Perspectives on Accelerated Methods for Combinatorial Optimization* (CCF 1718342), 2017-2020

PI for NSF AF Grant *New Perspectives on Spectral Methods for Graph Algorithms* (CCF 1319460), 2013-2017

co-PI for DHS ALERT Subaward *Anomaly Detection in Advanced Imaging Technology Systems based on Graph Theory* (DHS 505035-78050) 2017-2018

PUBLICATIONS

- J.Diakonikolas, M.Fazel and L.Orecchia. *Fair Packing and Covering on a Relative Scale.* **SIAM Journal on Optimization**, vol. 30:4, pp.3284–3314, 2020.

- J.Diakonikolas and L.Orecchia. *The Approximate Duality Gap Technique: A Unified Theory of First-Order Methods.* **SIAM Journal on Optimization**, vol. 29:1, pp. 660–689, 2019.

- J.Diakonikolas and L.Orecchia. *On Acceleration with Noise-Corrupted Gradients.* **ICML'18**: Proc. Intl. Conf. Machine Learning, pp. 1019–1028, 2018.

- J.Diakonikolas and L.Orecchia. *Alternating Randomized Block Coordinate Descent.* **ICML'18**: Proc. Intl. Conf. Machine Learning, pp. 1224–1232, 2018.

- Z.Allen-Zhu and L.Orecchia. *Nearly linear-time packing and covering LP solvers*. **Mathematical Programming, Series A**, vol. 175, pp. 307-353, 2018.

- J.Diakonikolas and L.Orecchia. *Accelerated Extra-Gradient Descent: A Novel Accelerated First-Order Method*. **ITCS'18**: Innovations in TCS Conf., pp. 23:1-23:19, 2018.

- C.Aksoylar, L.Orecchia and V.Saligrama, *Connected Subgraph Detection with Mirror Descent on SDPs*. **ICML'17**: Proc. Intl. Conf. Machine Learning, pp. 51–59, 2017.

- Z.Allen-Zhu and L.Orecchia. *Linear Coupling of Gradient and Mirror Descent*. **ITCS'17**: Innovations in TCS Conf., pp. 3:1-3:22, 2017.

- Z.Allen-Zhu, A.Bhaskara, S.Lattanzi, V.Mirrokni and L.Orecchia. *Expanders Using Local Edge Flips*. **SODA'16**: Proc. ACM-SIAM 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**: Proc. ACM-SIAM 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**: Proc. ACM 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**: Proc. ACM 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**: Proc. ACM-SIAM 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**: Proc. ACM-SIAM 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**: Proc. ACM 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**: Proc. ACM 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**: Proc. ACM-SIAM 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**, The University of Chicago
	"CMSC25460: Introduction to Optimization" — Spring 2020, Spring 2021
	"CMSC27200: Theory of Algorithms" — Winter 2020, Winter 2021
	"CMSC35410: Spectral Methods" — Fall 2019

Instructor, Boston University
"CS131: Combinatoric Structures"   Fall 2015, Spring 2017
"CS330: Introduction to Algorithms"   Fall 2018
"CS507: Convex Optimization Algorithms"   Spring 2018, Spring 2019
"CS591: Iterative Methods for Graph Algorithms"   Spring 2015, Fall 2016

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

ADVISING AND MENTORING

Co-advised **Ph.D. student Cem Aksoylar** in Electrical and Computer Engineering at Boston University from 2015 to 2016. Cem graduated in May 2016 and is now an Applied Scientist at Microsoft in Sunnyvale, CA.

Advised **Ph.D. student Zhenyu Liao** from 2015 to 2018. Zhenyu graduated in December 2018 and is now a Research Scientist at ByteDance AI Lab in Menlo Park, CA.

Supervised and mentored **postdoctoral associate Jelena Diakonikolas** née Maraşević from 2016 to 2018. Jelena is now an Assistant Professor in Department of Computer Sciences at University of Wisconsin-Madison.

PROFESSIONAL SERVICE AND OUTREACH

Program Committees: ICALP 2016, SODA 2017, SODA 2020, ITCS 2021, FOCS 2021, NeurIPS 2021.

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

Organizer of the workshop User-Friendly Tools from Continuous Optimization" at STOC'2017.

"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.]