

# TSELIL SCHRAMM

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tselilschramm.org

## CURRENT POSITION

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**Postdoctoral Fellow**, Harvard and MIT Spring 2018-present  
Hosted by Boaz Barak, Jon Kelner, Ankur Moitra and Pablo Parrilo

## PREVIOUS POSITIONS

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**Google Research Fellow**, Simons Institute Fall 2017  
Program title: *Bridging Discrete and Continuous Optimization*

## EDUCATION

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**PhD UC Berkeley**, Computer Science 2012 – 2017  
Advised by Prasad Raghavendra and Satish Rao  
Dissertation title: *Random Matrices and the Sum-of-Squares Hierarchy*

**BSc Harvey Mudd College**, Math/Computer Science 2008 – 2012  
Graduated with High Distinction and honors in Math, Computer Science, and the Humanities

## RESEARCH INTERESTS

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My research area is theoretical computer science, and my interests include convex optimization, statistical inference, and spectral algorithms. Recently I have been working to understand the power and limitations of the sum-of-squares semidefinite programming hierarchy, and particularly its performance for statistical problems.

## HONORS AND AWARDS

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**NSF Graduate Research Fellow**, National Science Foundation 2013 – 2017

**NDSEG Fellowship Recipient**, US Department of Defense March 2013

**Chancellor's Fellow**, UC Berkeley 2012 – 2017

**Radley Prize in the Humanities, Soc. Sciences, & Arts**, Harvey Mudd College May 2012

**Freshman Writing Award**, Harvey Mudd College September 2009

## INTERNSHIP

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**Theory Group Intern**, Microsoft Research Redmond Summer 2014  
Hosted by Konstantin Makarychev

## TEACHING EXPERIENCE

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- CS229R: Physics and Computation Seminar**, Harvard Fall 2019  
Co-taught with Boaz Barak
- CS270: Graduate Algorithms**, UC Berkeley Spring 2015  
Graduate Student Instructor, assistant to Lap Chi Lau
- CS70: Introduction to Discrete Math and Probability Theory**, UC Berkeley Fall 2013  
Graduate Student Instructor, assistant to Umesh Vazirani
- CS170: Undergraduate Algorithms**, UC Berkeley Spring 2013  
Graduate Student Instructor, assistant to Christos Papadimitriou and Prasad Raghavendra

## PAPERS

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- The threshold for SDP-refutation of random regular NAE-3SAT**, with Yash Deshpande, Andrea Montanari, Ryan O'Donnell and Subhabrata Sen. In *Proceedings of SODA 2019*. Preprint on arXiv:1804.05230.
- SOS lower bounds with hard constraints: think global, act local**, with Pravesh Kothari and Ryan O'Donnell. In *Proceedings of ITCS 2019*. Preprint on arXiv:1809.01207.
- Computing exact minimum cuts without knowing the graph**, with Aviad Rubinfeld and S. Matthew Weinberg. In *Proceedings of ITCS 2018*, pp. 39:1–39:16. Preprint on arXiv:1711.03165.
- The power of sum-of-squares for detecting hidden structures**, with Samuel B. Hopkins, Pravesh K. Kothari, Aaron Potechin, Prasad Raghavendra and David Steurer. In *Proceedings of FOCS 2017*. Preprint on arXiv:1710-05017.
- Fast and robust tensor decomposition with applications to dictionary learning**, with David Steurer. In *Proceedings of COLT 2017*, pp. 1760–1793. Preprint on arXiv:1706.08672.
- Strongly refuting random CSPs below the spectral threshold**, with Prasad Raghavendra and Satish Rao. In *Proceedings of STOC 2017*, pp. 121–131. Preprint on arXiv:1605.00058.
- Braess's paradox for the spectral gap in random graphs and delocalization of eigenvectors**, with Ronen Eldan and Miklós Rácz. *Random Structures and Algorithms* 50, 4, 2017, 584–611. Preprint on arXiv:1504.07669.
- Fast spectral algorithms from sum-of-squares proofs: tensor decomposition and planted sparse vectors**, with Samuel B. Hopkins, Jonathan Shi and David Steurer. In *Proceedings of STOC 2016*, pp. 178–191. Preprint on arXiv:1512.02337.
- On the integrality gap of degree-4 sum of squares for planted clique**, with Samuel B. Hopkins, Pravesh Kothari, Aaron Potechin and Prasad Raghavendra. In *Proceedings of SODA 2016*. Invited to the SODA 2016 special issue of ACM Transactions on Algorithms. Preprint on arXiv:1507.05136.
- Global and local information in clustering labeled block models**, with Varun Kanade and Elchanan Mossel. *IEEE Transactions on Information Theory* 62, 10, 2016, 5906–5917. Preprint on arXiv:1404.6325.

**Near optimal LP rounding algorithm for correlation clustering on complete and complete k-partite graphs**, with Shuchi Chawla, Konstantin Makarychev and Grigory Yaroslavtsev. In *Proceedings of STOC 2015*, pp. 219–228. Preprint on arXiv:1412.0681.

**Gap amplification for small-set expansion via random walks**, with Prasad Raghavendra. In *Proceedings of APPROX/RANDOM 2014*, pp. 381–391. Preprint on arXiv:1301.1493.

## PREPRINTS

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**(Nearly) efficient algorithms for the graph matching problem on correlated random graphs**, with Boaz Barak, Chi-Ning Chou, Zhixian Lei and Yueqi Sheng. 2018. In submission. Preprint on arXiv:1805.02349.

**A robust spectral algorithm for overcomplete tensor decomposition**, with Samuel B. Hopkins and Jonathan Shi. 2018. In submission.

**Sherali–Adams strikes back**, with Ryan O’Donnell. 2018. In submission.

## SERVICE

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**Program Committee Member**, FOCS 2019  
60th Foundations of Computer Science Conference

**Program Committee Member**, APPROX 2018  
21st Conference on Approximation Algorithms

**Program Committee Member**, ITCS 2018  
9th Innovations in Theoretical Computer Science Conference

**Co-Organizer**, Theory Lunch Seminar 2015 - 2017  
UC Berkeley CS Theory Group

**Co-President**, CS Graduate Student Association Fall 2013 - Spring 2014  
UC Berkeley Department of Computer Science

## INVITED TALKS

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**Duke Theory Seminar** November 2018  
*(Nearly) efficient algorithms for the graph matching problem on correlated random graphs*

**Harvard Random Matrices & Probability Seminar** October 2018  
*(Nearly) efficient algorithms for the graph matching problem on correlated random graphs*

**ICERM Real Algebraic Geometry & Optimization Workshop** October 2018  
*Spectral algorithms capture sum-of-squares on average*

**MIT Stochastics and Statistics Seminar** October 2018  
*(Nearly) efficient algorithms for the graph matching problem on correlated random graphs*

**Georgia Tech Theory Seminar** September 2018  
*(Nearly) efficient algorithms for the graph matching problem on correlated random graphs*

<b>Oaxaca Analytic Techniques in TCS Workshop</b> <i>(Nearly) efficient algorithms for the graph matching problem on correlated random graphs</i>	August 2018
<b>Dagstuhl CSPs Workshop</b> <i>Refuting random CSPs</i>	June 2018
<b>Highlights of Algorithms Invited Talk</b> <i>The power of sum-of-squares for detecting hidden structures</i>	June 2018
<b>MIT Combinatorics Seminar</b> <i>(Nearly) efficient algorithms for the graph matching problem on correlated random graphs</i>	May 2018
<b>Princeton Theory Seminar</b> <i>(Nearly) efficient algorithms for the graph matching problem on correlated random graphs</i>	April 2018
<b>Conference on Information Systems and Sciences Invited Session</b> <i>Tensor Decomposition: speeding up sum-of-squares algorithms</i>	March 2018
<b>Banff Workshop on Approximation Algorithms and Hardness</b> <i>Spectral algorithms <math>\equiv</math> sum-of-squares on average</i>	November 2017
<b>Simons Institute Workshop on Hierarchies, Extended Formulations, and Matrix-Analytic Techniques</b> <i>Fast spectral algorithms from sum-of-squares analyses</i>	November 2017
<b>San Diego Theory Seminar</b> <i>Duality of low-degree SoS refutations and efficient spectral algorithms in the average case</i>	November 2017
<b>Oberwolfach Workshop on Proof Complexity and Beyond</b> <i>Duality of low-degree SoS refutations and efficient spectral algorithms in the average case</i>	August 2017
<b>Microsoft Research Redmond Theory Lunch</b> <i>Computing exact minimum cuts without knowing the graph</i>	August 2017
<b>AIM Workshop on Phase Transitions in Randomized Computational Problems</b> <i>Refuting random CSPs</i>	June 2017
<b>University of Washington Theory Lunch</b> <i>Computing exact minimum cuts without knowing the graph</i>	May 2017
<b>Avner Magen Memorial Lecture (at the Fields Institute)</b> <i>Strongly refuting random CSPs below the spectral threshold</i>	April 2017
<b>Toyota Institute of Technology Chicago</b> <i>Adventures with sum-of-squares</i>	January 2017
<b>Microsoft Research Redmond</b> <i>Adventures with sum-of-squares (and randomness)</i>	January 2017
<b>UC Berkeley Theory Lunch</b> <i>Strongly refuting random CSPs below the spectral threshold</i>	October 2016
<b>Banff Workshop on Computational Complexity</b> <i>Strongly refuting random CSPs below the spectral threshold</i>	September 2016
<b>University of Washington Theory Seminar</b> <i>Strongly refuting random CSPs below the spectral threshold</i>	August 2016

<b>China Theory Week</b> <i>Strongly refuting random CSPs below the spectral threshold</i>	August 2016
<b>Banff Workshop on Algebraic and Spectral Graph Theory</b> <i>Strongly refuting random CSPs below the spectral threshold</i>	August 2016
<b>MIT Algorithms &amp; Complexity Seminar</b> <i>Strongly refuting random CSPs below the spectral threshold</i>	May 2016
<b>Stanford Theory Seminar</b> <i>Strongly refuting random CSPs below the spectral threshold</i>	April 2016
<b>Simons Institute Spectral Graph Theory Reunion Workshop</b> <i>Overcomplete tensor decomposition: speeding up sum-of-squares</i>	December 2015
<b>Stanford Theory Lunch</b> <i>Overcomplete tensor decomposition: speeding up sum-of-squares</i>	December 2015
<b>Cornell Probability Seminar</b> <i>Braess's paradox for the spectral gap in random graphs and delocalization of eigenvectors</i>	November 2015
<b>Cornell Theory Seminar</b> <i>Tight lower bounds for planted clique in the degree-4 sum-of-squares program</i>	November 2015
<b>UC Berkeley Theory Lunch</b> <i>Overcomplete tensor decomposition: speeding up sum-of-squares</i>	October 2015
<b>UC Berkeley Theory Lunch</b> <i>A better approximation for correlation clustering</i>	October 2014