

# AARON POTECHIN

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## POSITIONS

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University of Chicago Assistant Professor	2018 - Present Chicago, IL
Kungliga Tekniska Högskolan Postdoc	2017 - 2018 Stockholm, Sweden
Cornell University and the Institute for Advanced Study Postdoc	2015 - 2017 Ithaca, NY and Princeton, NJ

## EDUCATION

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Massachusetts Institute of Technology Ph.D. in Mathematics Dissertation: “Analyzing Monotone Space Complexity Via the Switching Network Model”	2015
University of Cambridge (Part III of the Math Tripos) Master of Advanced Study	2010
Princeton B.A. in Mathematics (summa cum laude with high honors) Dissertation: “Bounds on Monotone Switching Networks for Directed Connectivity”	2009

## AWARDS AND HONORS

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NSF SMALL grant: Further Investigation of the Sum of Squares Hierarchy	2020
“A Nearly Tight Sum-of-Squares Lower Bound for the Planted Clique Problem” invited to SICOMP FOCS 2016 Special Issue	2016
“On the Integrality Gap of Degree-4 Sum of Squares for Planted Clique” TALG special issue for SODA 16	invited to 2016
“Bounds on Monotone Switching Networks for Directed Connectivity” JACM FOCS 2010 Special Issue	invited to 2011
Machtey award for the best student paper at FOCS 2010	2010
NSF Graduate Research Fellowship	2010
George B. Covington Prize (Outstanding Senior Research in Mathematics)	2009
Churchill Scholarship	2009
Barry M. Goldwater Scholarship	2008
Class of 1861 Prize (highest scoring sophomore at Princeton on the Putnam exam)	2007

## CURRENT STUDENTS

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Neng Huang, Zelin Lv, and Joseph Tsang

## PREVIOUS STUDENTS

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Students for whom I was the primary advisor: Wenjun Cai (co-advised by Sasha Razborov),  
Chris Jones, and Goutham Rajendran (co-advised by Madhur Tulsiani)  
Students for whom I was a secondary advisor: Bohdan Kivva (advised by Laci Babai)

## JOURNAL PAPERS

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- D. Beck, Z. Lv, and A. Potechin. The Sixth Moment of Random Determinants. *Journal of Integer Sequences*, Vol. 26, Article 23.6.3. 2023
- A. Potechin and J. Shallit. Lengths of Words Accepted by Nondeterministic Finite Automata. *Information Processing Letters*. Volume 162. 2020
- B. Barak, S. Hopkins, J. Kelner, P. Kothari, A. Moitra, and A. Potechin. A Nearly Tight Sum-of-Squares Lower Bound for the Planted Clique Problem. *SIAM Journal on Computing*, Volume 48 No. 2 p. 687-735. 2019
- S. Hopkins, P. Kothari, A. Potechin, P. Raghavendra, and T. Schramm. On the Integrality Gap of Degree-4 Sum of Squares for Planted Clique. *ACM Transactions on Algorithms (TALG) - Special Issue on SODA'16 and Regular Papers*. Volume 14 Issue 3, Article No. 28. p.1-31. 2018
- S. Chan and A. Potechin. Tight Bounds for Monotone Switching Networks Via Fourier Analysis. *Theory of Computing* Vol. 10 Article 15, p. 389-419. 2014
- A. Potechin. Bounds on Monotone Switching Networks for Directed Connectivity. *Journal of the ACM (JACM)* Volume 64, Issue 4, Article No. 29. p.1-48. 2017
- A. Berget, A. Manion, M. Maxwell, A. Potechin, and V. Reiner. The Critical Group of a Line Graph. *Annals of Combinatorics* Volume 16, Issue 3, p.449-488. 2012
- A. Potechin. Maximal Caps in  $AG(6,3)$ . *Designs, Codes, and Cryptography*, Volume 36, Issue 3, p.243-259. 2008

## CONFERENCE PAPERS

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- S. F. de Rezende, A. Potechin, and K. Risse. Clique Is Hard on Average for Unary Sherali-Adams. *FOCS 2023*
- J. Brakensiek, N. Huang, A. Potechin, and U. Zwick. Separating MAX 2-AND, MAX DI-CUT, and MAX CUT. *FOCS 2023*
- J.T. Hsieh, P. Kothari, A. Potechin, and J. Xu. Ellipsoid Fitting Up to a Constant. *ICALP 2023*
- A. Potechin, P. Turner, P. Venkat, and A. Wein. Near-optimal fitting of ellipsoids to random points. *COLT 2023*
- C. Jones, A. Potechin, G. Rajendran, and J. Xu. Sum-of-Squares Lower Bounds for Densest k-Subgraph. *STOC 2023*
- A. Potechin and G. Rajendran. Sub-exponential time Sum-of-Squares lower bounds for Principal Components Analysis. *NeurIPS 2022*
- G. Cohen, D. Minzer, S. Peleg, A. Potechin, and A. Ta-Shma. Expander Random Walks: The General Case and Limitations. *ICALP 2022*
- C. Jones and A. Potechin. Almost-Orthogonal Bases for Inner Product Polynomials. *ITCS 2022*
- C. Jones, A. Potechin, G. Rajendran, M. Tulsiani, and J. Xu. Sum-of-Squares Lower Bounds for Sparse Independent Set. *FOCS 2021*
- A. Kurpisz, A. Potechin, and E. S. Wirth. SoS certification for symmetric quadratic functions and its connection to constrained Boolean hypercube optimization. *ICALP 2021*
- J. Brakensiek, N. Huang, A. Potechin, and U. Zwick. On the Mysteries of MAX NAE-SAT. *SODA 2021*
- M. Ghosh, F. G. Jeronimo, C. Jones, A. Potechin, and G. Rajendran. Sum-of-Squares Lower Bounds for Sherrington-Kirkpatrick via Planted Affine Planes. *FOCS 2020*
- N. Huang and A. Potechin. On the Approximability of Presidential Type Predicates. *APPROX 2020*
- A. Potechin. Sum of squares bounds for the total ordering principle. *CCC 2020*
- A. Potechin. On the Approximation Resistance of Balanced Linear Threshold Functions. *STOC 2019*
- A. Potechin. Sum of squares lower bounds from symmetry and a good story. *ITCS 2019*

S. Hopkins, P. Kothari, A. Potechin, P. Raghavendra, T. Schramm, and D. Steurer. The Power of Sum-of-Squares for Detecting Hidden Structures. FOCS 2017  
A. Potechin and D. Steurer. Exact Tensor Completion with Sum of Squares. COLT 2017  
A. Potechin. A Note on Amortized Branching Program Complexity. CCC 2017  
D. Medarametla and A. Potechin. Bounds on the Norms of Uniform Low Degree Graph Matrices. RANDOM 2016  
R. Meka, A. Potechin, and A. Wigderson. Sum of Squares Lower Bounds for Planted Clique. STOC 2015

## PREPRINTS

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W. Cai and A. Potechin. On Mixing Distributions Via Random Orthogonal Matrices and the Spectrum of the Singular Values of Multi-Z Shaped Graph Matrices. arXiv 2206.02224. 2022  
A. Potechin and A. Zhang. Bounds on the Total Coefficient Size of Nullstellensatz Proofs of the Pigeonhole Principle and the Ordering Principle. arXiv 2205.03577. 2022  
B. Kivva and A. Potechin. Exact nuclear norm, completion, and decomposition for random overcomplete tensors via degree-4 SOS. arXiv 2011.09416. 2020  
A. Potechin and G. Rajendran. Machinery for Proving Sum-of-Squares Lower Bounds on Certification Problems. arXiv 2011.04253. 2020  
W. Cai and A. Potechin. The Spectrum of the Singular Values of Z-Shaped Graph Matrices. arXiv 2006.14144. 2020  
A. Potechin and H. Y. Tsang. A Conjecture on Induced Subgraphs of Cayley Graphs. arXiv 2003.13166. 2020  
K. Ahn, D. Medarametla, and A. Potechin. Graph Matrices: Norm Bounds and Applications. arXiv 1604.03423. 2020 (Note: This is a major update of the paper “Bounds on the Norms of Uniform Low Degree Graph Matrices.”)  
A. Potechin and L. Yang. A Note on Property Testing Sum of Squares and Multivariate Polynomial Interpolation. arXiv 1709.03198. 2017  
A. Potechin. A Note on a Problem of Erdős and Rothschild. arXiv 1412.1838. 2014  
A. Potechin. Improved Upper and Lower Bound Techniques for Monotone Switching Networks for Directed Connectivity. arXiv 1302.3726. 2013  
J. Brakensiek and A. Potechin. Bounds on the Size of Sound Monotone Switching Networks Accepting Permutation Sets of Directed Trees. arXiv 1301.3780. 2013  
K. Carde, J. Loubert, A. Potechin, and A. Sanborn. Proof of Han’s Hook Expansion Conjecture. arXiv 0808.0928. 2008

## HIGH SCHOOL RESEARCH MENTORING

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PRIMES student: Dhruv Medarametla (Intel semifinalist) 2014-2015  
RSI students:  
Joshua Brakensiek (won a Davidson fellowship) and Gil Goldshlager (Intel semifinalist) 2013  
Eric Mannes (Intel semifinalist) and Jessica Ohrlein 2012