

# Nima Anari

@ anari@cs.stanford.edu

+1 (510) 520-7774

https://nimaanari.com

Gates Computer Science #168A  
353 Jane Stanford Way  
Stanford, CA 94305

## Research Interests

---

Sampling algorithms and Markov chains

High-dimensional expanders

Geometry of polynomials

Combinatorial optimization

## Academic Positions

---

**Stanford University** ..... 9/2019 - present

Assistant Professor of Computer Science.  
Robert N. Noyce Faculty Fellow.

**Simons Institute for the Theory of Computing** ..... 1/2019 - 5/2019

Microsoft Research Fellow.

**Stanford University** ..... 1/2018 - 8/2019

Research Engineer in Computer Science.

**Simons Institute for the Theory of Computing** ..... 8/2017 - 12/2017

Research Fellow.

**Stanford University** ..... 1/2016 - 8/2017

Postdoctoral Scholar in Management Science and Engineering, Hosted by Amin Saberi.

## Education

---

**University of California, Berkeley** ..... 8/2010 - 12/2015

Ph.D. in Computer Science.  
Advisor: Satish Rao.

**Sharif University of Technology** .....9/2006 - 7/2010  
B.Sc. in Computer Engineering and B.Sc. in Pure Mathematics.

## Honors and Awards

---

**Sloan Research Fellowship** ..... 2021  
Alfred P. Sloan Foundation.

**NSF CAREER Award** ..... 2021  
National Science Foundation.

**STOC 2019 Best Paper Award** ..... 2019  
For the paper “Log-Concave Polynomials II: High-Dimensional Walks and an FPRAS for Counting Bases of a Matroid.”

**Google Faculty Research Award** ..... 2019  
Google.

**Microsoft Research Fellow** ..... 2019  
Simons Institute for the Theory of Computing.

**Simons-Berkeley Research Fellow** ..... 2017  
Simons Institute for the Theory of Computing

**Berkeley Fellowship for Graduate Studies** ..... 2010 - 2012  
University of California, Berkeley.

**Ranked 14th Team** ..... ICPC 2009  
ACM International Collegiate Programming Contest World Finals.

**Ranked 13th Team** ..... ICPC 2008  
ACM International Collegiate Programming Contest World Finals.

**First Prize** ..... IMC 2008  
International Mathematics Competition.

**First Prize** ..... IMC 2007  
International Mathematics Competition.

**Outstanding Student Award** ..... 2007, 2008, 2009  
Sharif University of Technology

**Silver Medal** ..... IOI 2006  
International Olympiad in Informatics.

**Gold Medal** ..... IMO 2006  
International Mathematical Olympiad.

**Silver Medal** ..... IMO 2005  
International Mathematical Olympiad.

## Teaching

---

**CS 161: Design and Analysis of Algorithms** ..... Winter 2022  
Stanford University.

**CS 221: Artificial Intelligence: Principles and Techniques** ..... Spring 2021  
Stanford University.

**CS 161: Design and Analysis of Algorithms** ..... Winter 2021  
Stanford University.

**CS 263: Counting and Sampling** ..... Autumn 2020  
Stanford University.

**CS 221: Artificial Intelligence: Principles and Techniques** ..... Spring 2020  
Stanford University.

**CS 260: Geometry of Polynomials in Algorithm Design** ..... Winter 2020  
Stanford University.

## Mentoring

---

**Tianyu Liu** ..... Postdoc, 2022 - present  
Computing Innovation Fellow.

**Frederic Koehler** ..... Postdoc, 2022 - present  
Motwani Postdoctoral Fellow. Co-hosted with Omer Reingold and Gregory Valiant.

**Callum Burgess** ..... Undergrad, 2021  
Summer CURIS Project.

**Thuy-Duong (June) Vuong** ..... Ph.D., 2020 - present  
Co-advised with Moses Charikar.

**Nathan Hu** ..... Undergrad, 2020  
Summer CURIS Project.

**Armaun Sanayi** ..... Undergrad, 2020  
Summer CURIS Project.

## Professional Service

---

**Program Committee Member** ..... ITCS 2021

**Program Committee Member** ..... STOC 2020

**Program Committee Member** ..... RANDOM 2020

**Workshop Organizer** ..... STOC 2019  
Co-organized workshop on “Nash Welfare, Market Equilibrium, and Stable Polynomials.”

**Program Committee Member** ..... APPROX 2019

**Workshop Organizer** ..... FOCS 2016  
Co-organized workshop on “Approximating Traveling Salesman Problems using Algebraic Techniques.”

## Miscellaneous Jobs

---

**Microsoft Research, Redmond** ..... 5/2015 - 8/2015  
Intern in the Theory Group.

**Google, New York** ..... 5/2014 - 8/2014  
Intern in the Algorithms Research Group.

**Jane Street, New York** ..... 5/2013 - 8/2013  
Intern.

**Facebook, Menlo Park** ..... 5/2012 - 8/2012  
Intern.

**D.E. Shaw & Co., New York** ..... 6/2011 - 8/2011  
Intern.

## Invited Talks

---

|  |         |
|--|---------|
| <b>Center for Discrete Mathematics and Theoretical Computer Science (DIMACS)</b> ..... | 5/2022  |
| Workshop on “Entropy and Optimization.”  |         |
| <b>University of Cambridge</b> .....   | 2/2022  |
| Probability seminar.   |         |
| <b>Oberwolfach Research Institute for Mathematics</b> .....                            | 11/2021 |
| Workshop on “Combinatorial Optimization.”  |         |
| <b>Simons Foundation, New York</b> .....   | 11/2021 |
| Workshop on “High-Dimensional Expanders.”  |         |
| <b>University of Illinois, Urbana-Champaign</b> .....                                  | 11/2021 |
| Theory Seminar.  |         |
| <b>STOC 2021</b> .....   | 6/2021  |
| Invited Tutorial on “Log-Concave Polynomials.”   |         |
| <b>Tata Institute of Fundamental Research</b> .....                                    | 1/2021  |
| Workshop on Uniqueness Methods in Statistical Mechanics .....                          |         |
|  | 12/2020 |
| <b>Institute for Advanced Studies (IAS)</b> .....                                      | 10/2020 |
| Computer Science and Discrete Math Seminar.  |         |
| <b>Highlights of Algorithms (HALG)</b> .....   | 8/2020  |
| <b>Purdue University</b> .....   | 4/2020  |
| Theory Seminar.  |         |
| <b>University of California, Berkeley</b> .....  | 3/2020  |
| Theory Seminar.  |         |
| <b>MIT</b> .....   | 1/2020  |
| Workshop on “Learning Under Complex Structure.”  |         |
| <b>University of California, Los Angeles</b> .....                                     | 11/2019 |
| Combinatorics Seminar.   |         |
| <b>Georgia Tech</b> .....  | 11/2019 |
| Invited Lectures.  |         |
| <b>Highlights of Algorithms (HALG)</b> .....   | 6/2019  |

|  |         |
|--|---------|
| <b>Banff International Research Station</b> .....                                    | 5/2019  |
| Workshop on “Geometry of Real Polynomials.”  |         |
| <b>Simons Institute for the Theory of Computing</b> .....                            | 5/2019  |
| Workshop on “Hyperbolic Polynomials and Hyperbolic Programming.”                     |         |
| <b>Bay Area Discrete Math Workshop (BADMath)</b> .....                               | 4/2019  |
| <b>University of California, Berkeley</b> .....                                      | 4/2019  |
| Probability Seminar.   |         |
| <b>Simons Institute for the Theory of Computing</b> .....                            | 3/2019  |
| Workshop on “Deterministic Counting, Probability, and Zeros of Partition Functions.” |         |
| <b>Simons Institute for the Theory of Computing</b> .....                            | 2/2019  |
| Workshop on “Beyond Randomized Rounding and the Probabilistic Method.”               |         |
| <b>University of California, San Diego</b> .....                                     | 1/2019  |
| Theory Seminar.  |         |
| <b>Simons Institute for the Theory of Computing</b> .....                            | 1/2019  |
| Workshop on “Geometry of Polynomials Bootcamp.”                                      |         |
| <b>Stanford University</b> .....   | 11/2018 |
| Probability Seminar.   |         |
| <b>EPFL</b> .....  | 11/2018 |
| Workshop on “Applications of Partition Functions.”                                   |         |
| <b>MIT</b> .....   | 10/2018 |
| Algorithms and Complexity Seminar.   |         |
| <b>EPFL</b> .....  | 10/2018 |
| Workshop on “Theoretical Challenges in Partition Functions.”                         |         |
| <b>Harvard University</b> .....  | 9/2018  |
| Theory of Computing Seminar.   |         |
| <b>Banff International Research Station</b> .....                                    | 9/2018  |
| Workshop on “The Traveling Salesman Problem: Algorithms & Optimization.”             |         |
| <b>Georgia Tech</b> .....  | 4/2018  |
| ARC Colloquium.  |         |

**Institute for Pure & Applied Mathematics (IPAM)** ..... 4/2018  
Workshop on “Expected Characteristic Polynomial Techniques and Applications.”

**TCS+** ..... 3/2018

**Simons Institute for the Theory of Computing** ..... 9/2017  
Workshop on “Discrete Optimization via Continuous Relaxation.”

## Manuscripts and Working Papers

---

- 39 Entropic Independence II: Optimal Sampling and Concentration via Restricted Modified Log-Sobolev Inequalities**  
Nima Anari, Vishesh Jain, Frederic Koehler, Huy Tuan Pham, Thuy-Duong Vuong  
CoRR, abs/2111.03247  
Extended abstract merged with the paper “Entropic Independence I: Modified Log-Sobolev Inequalities for Fractionally Log-Concave Distributions and High-Temperature Ising Models”.
- 38 Entropic Independence I: Modified Log-Sobolev Inequalities for Fractionally Log-Concave Distributions and High-Temperature Ising Models**  
Nima Anari, Vishesh Jain, Frederic Koehler, Huy Tuan Pham, Thuy-Duong Vuong  
CoRR, abs/2106.04105  
Extended abstract merged with the paper “Entropic Independence II: Optimal Sampling and Concentration via Restricted Modified Log-Sobolev Inequalities”.
- 37 Optimal Sublinear Sampling of Spanning Trees and Determinantal Point Processes via Average-Case Entropic Independence**  
Nima Anari, Yang P. Liu, Thuy-Duong Vuong  
CoRR, abs/2204.02570
- 36 Improved Sampling-to-Counting Reductions in High-Dimensional Expanders and Faster Parallel Determinantal Sampling**  
Nima Anari, Callum Burgess, Kevin Tian, Thuy-Duong Vuong  
CoRR, abs/2203.11190
- 35 From Sampling to Optimization on Discrete Domains with Applications to Determinant Maximization**  
Nima Anari, Thuy-Duong Vuong  
CoRR, abs/2102.05347
- 34 Batch Active Learning Using Determinantal Point Processes** .....  
Erdem Biyik, Kenneth Wang, Nima Anari, Dorsa Sadigh  
CoRR, abs/1906.07975

- 33 **Log-Concave Polynomials III: Mason’s Ultra-Log-Concavity Conjecture for Independent Sets of . . . . Matroids**  
 Nima Anari, Kuikui Liu, Shayan Oveis Gharan, Cynthia Vinzant  
 CoRR, abs/1811.01600
- 32 **The Kadison-Singer Problem for Strongly Rayleigh Measures and Applications to Asymmetric TSP . . . .**  
 Nima Anari, Shayan Oveis Gharan  
 CoRR, abs/1412.1143

## Publications

---

- 31 **Entropic independence: optimal mixing of down-up random walks . . . . .** STOC 2022  
 Nima Anari, Vishesh Jain, Frederic Koehler, Huy Tuan Pham, Thuy-Duong Vuong  
 STOC ’22: 54th Annual ACM SIGACT Symposium on Theory of Computing, Rome, Italy, June 20 - 24, 2022
- 30 **Domain Sparsification of Discrete Distributions Using Entropic Independence . . . . .** ITCS 2022  
 Nima Anari, Michal Derezinski, Thuy-Duong Vuong, Elizabeth Yang  
 13th Innovations in Theoretical Computer Science Conference, ITCS 2022, January 31 - February 3, 2022, Berkeley, CA, USA, 215
- 29 **The Bethe and Sinkhorn Permanents of Low Rank Matrices and Implications for Profile . . . . COLT 2021 Maximum Likelihood**  
 Nima Anari, Moses Charikar, Kirankumar Shiragur, Aaron Sidford  
 Conference on Learning Theory, COLT 2021, 15-19 August 2021, Boulder, Colorado, USA, 134
- 28 **Sampling Arborescences in Parallel . . . . .** ITCS 2021  
 Nima Anari, Nathan Hu, Amin Saberi, Aaron Schild  
 12th Innovations in Theoretical Computer Science Conference, ITCS 2021, January 6-8, 2021, Virtual Conference, 185
- 27 **Learning Multimodal Rewards from Rankings . . . . .** CoRL 2021  
 Vivek Myers, Erdem Biyik, Nima Anari, Dorsa Sadigh  
 Conference on Robot Learning, 8-11 November 2021, London, UK, 164
- 26 **Fractionally log-concave and sector-stable polynomials: counting planar matchings . . . . STOC 2021 and more**  
 Yeganeh Alimohammadi, Nima Anari, Kirankumar Shiragur, Thuy-Duong Vuong  
 STOC ’21: 53rd Annual ACM SIGACT Symposium on Theory of Computing, Virtual Event, Italy, June 21-25, 2021



- 25 **Log-concave polynomials IV: approximate exchange, tight mixing times, and near-optimal sampling of forests** . . . . STOC 2021  
 Nima Anari, Kuikui Liu, Shayan Oveis Gharan, Cynthia Vinzant, Thuy-Duong Vuong  
 STOC '21: 53rd Annual ACM SIGACT Symposium on Theory of Computing, Virtual Event, Italy, June 21-25, 2021
- 24 **Matching Is as Easy as the Decision Problem, in the NC Model** . . . . . ITCS 2020  
 Nima Anari, Vijay V. Vazirani  
 11th Innovations in Theoretical Computer Science Conference, ITCS 2020, January 12-14, 2020, Seattle, Washington, USA, 151
- 23 **An Extension of Plücker Relations with Applications to Subdeterminant Maximization** . . . . APPROX 2020  
 Nima Anari, Thuy-Duong Vuong  
 Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques, APPROX/RANDOM 2020, August 17-19, 2020, Virtual Conference, 176
- 22 **Isotropy and Log-Concave Polynomials: Accelerated Sampling and High-Precision Counting of Matroid Bases** . . . . FOCS 2020  
 Nima Anari, Michal Derezinski  
 61st IEEE Annual Symposium on Foundations of Computer Science, FOCS 2020, Durham, NC, USA, November 16-19, 2020
- 21 **Spectral Independence in High-Dimensional Expanders and Applications to the Hard-core Model** . . . . FOCS 2020  
 Nima Anari, Kuikui Liu, Shayan Oveis Gharan  
 61st IEEE Annual Symposium on Foundations of Computer Science, FOCS 2020, Durham, NC, USA, November 16-19, 2020  
 Invited to special issue of SIAM Journal on Computing.
- 20 **Instance Based Approximations to Profile Maximum Likelihood** . . . . . NeurIPS 2020  
 Nima Anari, Moses Charikar, Kirankumar Shiragur, Aaron Sidford  
 Advances in Neural Information Processing Systems 33: Annual Conference on Neural Information Processing Systems 2020, NeurIPS 2020, December 6-12, 2020, virtual
- 19 **Nearly Optimal Pricing Algorithms for Production Constrained and Laminar Bayesian Selection** . . . . EC 2019  
 Nima Anari, Rad Niazadeh, Amin Saberi, Ali Shamel  
 Proceedings of the 2019 ACM Conference on Economics and Computation, EC 2019, Phoenix, AZ, USA, June 24-28, 2019

- 18 **Log-concave polynomials II: high-dimensional walks and an FPRAS for counting bases of a matroid** . . . . STOC 2019  
 Nima Anari, Kuikui Liu, Shayan Oveis Gharan, Cynthia Vinzant  
 Proceedings of the 51st Annual ACM SIGACT Symposium on Theory of Computing, STOC 2019, Phoenix, AZ, USA, June 23-26, 2019  
 Invited to Theory of Computing.  
 Awarded **Best Paper** of STOC 2019.
- 17 **Structured Robust Submodular Maximization: Offline and Online Algorithms** . . . . . AISTATS 2019  
 Nima Anari, Nika Haghtalab, Seffi Naor, Sebastian Pokutta, Mohit Singh, Alfredo Torricco  
 The 22nd International Conference on Artificial Intelligence and Statistics, AISTATS 2019, 16-18 April 2019, Naha, Okinawa, Japan, 89  
 INFORMS J. Comput., 33
- 16 **A Tight Analysis of Bethe Approximation for Permanent** . . . . . FOCS 2019  
 Nima Anari, Alireza Rezaei  
 60th IEEE Annual Symposium on Foundations of Computer Science, FOCS 2019, Baltimore, Maryland, USA, November 9-12, 2019  
 Invited to special issue of SIAM Journal on Computing.
- 15 **Log-Concave Polynomials I: Entropy and a Deterministic Approximation Algorithm for Counting Bases of Matroids** . . . . FOCS 2018  
 Nima Anari, Shayan Oveis Gharan, Cynthia Vinzant  
 59th IEEE Annual Symposium on Foundations of Computer Science, FOCS 2018, Paris, France, October 7-9, 2018
- 14 **Planar Graph Perfect Matching Is in NC** . . . . . FOCS 2018  
 Nima Anari, Vijay V. Vazirani  
 59th IEEE Annual Symposium on Foundations of Computer Science, FOCS 2018, Paris, France, October 7-9, 2018  
 J. ACM, 67  
 Invited to special issue of SIAM Journal on Computing.
- 13 **Graph Clustering using Effective Resistance** . . . . . ITCS 2018  
 Vedat Levi Alev, Nima Anari, Lap Chi Lau, Shayan Oveis Gharan  
 9th Innovations in Theoretical Computer Science Conference, ITCS 2018, January 11-14, 2018, Cambridge, MA, USA, 94
- 12 **Smoothed Analysis of Discrete Tensor Decomposition and Assemblies of Neurons** . . . . NeurIPS 2018  
 Nima Anari, Constantinos Daskalakis, Wolfgang Maass, Christos H. Papadimitriou, Amin Saberi, Santosh S. Vempala  
 Advances in Neural Information Processing Systems 31: Annual Conference on Neural Information Processing Systems 2018, NeurIPS 2018, December 3-8, 2018, Montréal, Canada

- 11 **Budget Feasible Procurement Auctions** ..... Oper. Res.  
 Nima Anari, Gagan Goel, Afshin Nikzad  
 Oper. Res., 66  
 Invited to GEB special issue on Algorithmic Game Theory.
- 10 **Approximating the Largest Root and Applications to Interlacing Families** ..... SODA 2018  
 Nima Anari, Shayan Oveis Gharan, Amin Saberi, Nikhil Srivastava  
 Proceedings of the Twenty-Ninth Annual ACM-SIAM Symposium on Discrete Algorithms, SODA 2018, New Orleans, LA, USA, January 7-10, 2018
- 9 **Nash Social Welfare for Indivisible Items under Separable, Piecewise-Linear Concave Utilities** ..... SODA 2018  
 Nima Anari, Tung Mai, Shayan Oveis Gharan, Vijay V. Vazirani  
 Proceedings of the Twenty-Ninth Annual ACM-SIAM Symposium on Discrete Algorithms, SODA 2018, New Orleans, LA, USA, January 7-10, 2018
- 8 **Simply Exponential Approximation of the Permanent of Positive Semidefinite Matrices** ..... FOCS 2017  
 Nima Anari, Leonid Gurvits, Shayan Oveis Gharan, Amin Saberi  
 58th IEEE Annual Symposium on Foundations of Computer Science, FOCS 2017, Berkeley, CA, USA, October 15-17, 2017
- 7 **Nash Social Welfare, Matrix Permanent, and Stable Polynomials** ..... ITCS 2017  
 Nima Anari, Shayan Oveis Gharan, Amin Saberi, Mohit Singh  
 8th Innovations in Theoretical Computer Science Conference, ITCS 2017, January 9-11, 2017, Berkeley, CA, USA, 67  
 Elevated to invited paper.
- 6 **A generalization of permanent inequalities and applications in counting and optimization** ..... STOC 2017  
 Nima Anari, Shayan Oveis Gharan  
 Proceedings of the 49th Annual ACM SIGACT Symposium on Theory of Computing, STOC 2017, Montreal, QC, Canada, June 19-23, 2017  
 Advances in Mathematics, 383
- 5 **Monte Carlo Markov Chain Algorithms for Sampling Strongly Rayleigh Distributions and Determinantal Point Processes** ..... COLT 2016  
 Nima Anari, Shayan Oveis Gharan, Alireza Rezaei  
 Proceedings of the 29th Conference on Learning Theory, COLT 2016, New York, USA, June 23-26, 2016, 49
- 4 **Effective-Resistance-Reducing Flows, Spectrally Thin Trees, and Asymmetric TSP** ..... FOCS 2015  
 Nima Anari, Shayan Oveis Gharan  
 IEEE 56th Annual Symposium on Foundations of Computer Science, FOCS 2015, Berkeley, CA, USA, 17-20 October, 2015  
 Invited to special issue of SIAM Journal on Computing.

- ③ **Mechanism Design for Crowdsourcing: An Optimal  $1-1/e$  Competitive Budget-Feasible Mechanism for Large Markets** . . . . FOCS 2014  
 Nima Anari, Gagan Goel, Afshin Nikzad  
 55th IEEE Annual Symposium on Foundations of Computer Science, FOCS 2014, Philadelphia, PA, USA, October 18-21, 2014
  
- ② **Euclidean Movement Minimization** . . . . . CCCG 2011  
 MohammadAmin Fazli, MohammadAli Safari, Nima Anari, Pooya Jalaly Khalilabadi, Mohammad Ghodsi  
 Proceedings of the 23rd Annual Canadian Conference on Computational Geometry, Toronto, Ontario, Canada, August 10-12, 2011  
 J. Comb. Optim., 32
  
- ① **Equilibrium Pricing with Positive Externalities** . . . . . WINE 2010  
 Nima Anari, Shayan Ehsani, Mohammad Ghodsi, Nima Haghpahan, Nicole Immorlica, Hamid Mahini, Vahab S. Mirrokni  
 Internet and Network Economics - 6th International Workshop, WINE 2010, Stanford, CA, USA, December 13-17, 2010. Proceedings, 6484  
 Theor. Comput. Sci., 476