Santosh S. Vempala

Professor of Computer Science
Georgia Institute of Technology
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Research Interests

The theory of algorithms; algorithmic tools for sampling, learning, optimization and data analysis; high-dimensional geometry; randomized linear algebra; Computing-for-Good (C4G).

Education

Carnegie Mellon University, (1993-1997)
School of CS, Ph.D. in Algorithms, Combinatorics and Optimization.
Thesis: "Geometric Tools for Algorithms." Advisor: Prof. Avrim Blum

Indian Institute of Technology, New Delhi, (1988-1992)
B. Tech. in Computer Science.

Awards

Fellow of the American Mathematical Society, 2022.
Best Paper ACM-SIAM Symposium on Discrete Algorithms (SODA), 2021.
Best Paper ITU Kaleidescope, 2019.
Gem of PODS (test of time award), 2019.
Edenfield Faculty Fellowship, 2019.
CIOS Course Effectiveness Teaching Award, 2016.
Frederick Storey chair, 2016-.
ACM fellow, 2015.
Open Source Software World Challenge, Gold prize, 2015.
GT Class of 1934 Outstanding Interdisciplinary Activities Award, 2012.
Georgia Trend 40-under-40, 2010.
Raytheon fellow, 2008.
Distinguished Professor of Computer Science, 2007-
Guggenheim Fellow, 2005
Alfred P. Sloan Research Fellow, 2002
NSF Career Award, 1999
Miller Fellow, U.C. Berkeley, 1998
IEEE Machtey Prize, 1997
Best Undergraduate Thesis Award, IIT Delhi, 1992

Appointments

Aug 06 –	Georgia Tech, Professor, Computer Science (primary), ISYE, Mathematics.
Aug 06–Apr 11	Founding Director, Algorithms and Randomness Center (ARC), Georgia Tech.
Jul 03–Jul 07	MIT, Associate Professor of Applied Mathematics
Jul 98–Jun 03	MIT, Assistant Professor of Applied Mathematics
Sep 97–Jun 98	MIT, Applied Mathematics Instructor.
2001, 03, 06, 14	Microsoft Research, Visiting Researcher.
Jul 98–Jun 99	UC Berkeley, Miller Research Fellow.

Advising

1. Adrian Vetta, Ph.D. (Math) 2002 (Assoc. Prof., McGill Univ.).
Thesis: "Graph Connectivity: Relaxations and Algorithms."
2. John Dunagan, Ph.D. (Math) 2002 (Microsoft Research).
Thesis: "A Geometric theory of Outliers and Perturbation."
3. Alantha Newman, Ph.D. (EECS) 2004 (CNRS).
Thesis: "Algorithms for Graph and String Layout."
4. Grant Wang, Ph.D. (EECS) 2006 (Microsoft).
Thesis: "Algorithms for Information Retrieval."
5. Luis Rademacher, Ph.D. (Math) 2007 (Assoc. Prof., UC Davis).
Thesis: "Dispersion of Mass and the Complexity of Randomized Algorithms."
(Johnson Prize)
6. Amit Deshpande, Ph.D. (Math) 2007 (Microsoft Research).
Thesis: "Sampling-based Algorithms for Dimension Reduction."
7. Charlie Brubaker, Ph.D. (CS) 2009 (Udacity).
Thesis: "Extensions of Principal Component Analysis." (GT CoC dissertation award; ACM distinguished dissertation nominee)
8. Karthekeyan Chandrasekaran, Ph.D. (ACO) 2012 (Asst. Prof. UIUC).
Thesis: "New Approaches to Integer Programming".
(Sigma Xi Best Thesis award)
9. Daniel Dadush, Ph.D. (ACO) 2012 (Asst. Prof. CWI).
Thesis: "Integer Programming, Lattice Algorithms, and Deterministic Volume Estimation". (A. W. Tucker Prize of the Math. Prog. Society).
10. Anand Louis, Ph.D. (ACO) 2014 (Asst. Prof. IISc).
Thesis: "The Complexity of Expansion Problems".
11. Ying Xiao, Ph.D. (ACO) 2014 (Google).
Thesis: "New Tools for Unsupervised Learning".
12. Ben Cousins, Ph.D. (ACO) 2017 (MSRI Berkeley).
Thesis: "Efficient High-dimensional Sampling and Integration".
13. Samantha Petti, Ph.D. (ACO) 2019 (Harvard)
Thesis: "Randomness as a Tool for Modeling and Uncovering Structure."
14. Samira Samadi, Ph.D. (CS) 2019 (Max Planck)
Thesis: "Human Aspects of ML."

Masters: David Pritchard, M. Eng. 2005, Abhisheak Iyer, M.S. 2009, Ruban Monu, M.S. 2010, Ashwin Paranjpe, M.S. 2010, Hiral Modi, M.S. 2011 (with Rosa Arriaga), Supraja Narasimhan, M.S. 2011, Hrushi Mehendale, M.S.2011, Amol Shintre M.S. 2012, Naomi Chopra M.S. 2013, Rohit Banga, MS. 2013, G.K. Arun Kumar M.S. 2014, Aishwarya Rajagopal M.S. 2015, Vasavi Gajarla M.S. 2016, Sai Theja Duthuluri, Dhruv Muttuchand M.S. 2017, Sakshi Gandhi M.S. 2018, Aditi Shah M.S. 2019.

Current Ph.D. Students: Aditi Laddha, He Jia, Mehrdad Ghadiri.

Postdocs: Adam Kalai (NSF, 2001-2003), now at Microsoft Research
Navin Goyal (ARC, 2007-2008), now at Microsoft Research
Luis Rademacher (ARC, 2007-2009), now at UC Davis
Elena Grigorescu (with Chris Peikert, NSF CI, 2010-2012), now at Purdue
Lev Reyzin (Simons, 2010-2012), now at Univ. of Illinois at Chicago.
Anup B. Rao (ARC, 2015-2017), now at Adobe Research.
John Wilmes (with Eric Vigoda, ARC, 2016-2018), now at Brandeis.
Greg Bodwin (ARC, 2018-2020), now at UMichigan.

Teaching

Mathematics for Computer Science (sophomore), Fall 97.
Combinatorial Optimization (senior), Fall 99, 00, 01, 03, 04.
An Eye for Elegance, Spring 98, 00, 01.
Random Walks and Polynomial-time Algorithms, Spring 02.
Geometric Tools for Algorithms, Spring 03.
Algorithmic Convex Geometry, Spring 04, Fall 08.
Spectral Algorithms, Spring 05, Fall07, Fall 10, Spring 13.
Computing for Good: Spring 08, Fall 09, Fall 12.
(intensive project-based course, jointly offered to undergrads/grads)
Computability and Algorithms, Spring 10, Spring 12, Fall 15, Spring 16, Fall 18.
Algorithms (honors), Spring 15.
Machine Learning Theory, Spring 15, Fall 16.
A Theoretician's Toolkit, Spring 16.
Computation and the Brain, Fall 16, Spring 21.
Simple Algorithms, Fall 17.
Continuous Algorithms. Spring 19, Spring 20.

Professional Activities

Editorial board: Theory of Computing, Algorithmica.

Program Committee member:
RANDOM 2017.
IEEE Symposium on the Foundations of Computer Science, 2015, 2019.
Innovations in Theoretical Computer Science, 2013, 2017.
ACM Conference on Learning Theory 1999, 2002, 2006, 2010, 2016, 2018, 2019, 2020, 2021.
ACM-SIAM Symposium on Discrete Algorithms 2001, 2005.
Approximation Algorithms for Combinatorial Optimization 2001, 2005.
ACM Symposium on the Theory of Computing 2003, 2007, 2010, 2022.
ACM Symposium on Computational Geometry 2007.
Mexican International conference on Computer Science 2003, 2005.
Latin American Theoretical Informatics, 2005.
Foundations of Software Technology and Theoretical CS 2005, 2008.
Integer Programming and Combinatorial Optimization, 2010.

Major events organized:
Theory of Computation Seminar, MIT, 2001-2004.
Applied Math Colloquium, MIT, 2005-2006.
AIM workshop on Algorithmic Convex Geometry, Palo Alto 2005.
ARC Colloquium series, Georgia Tech, 2006-2012.
ARC I, ARC2, ARC 3, ARC 4 (annual day-long workshop), Georgia Tech, 2006,2008,2009,2010.
Workshop in honor of Ravi Kannan's 60th birthday, CMU, 2013.
ARC-IMA workshop on Randomness and Computation, 2015.
HCOMP workshop on Mathematical Foundations of Human Computation, 2015.
Simons semesters on Machine Learning, Brain and Computation, Foundations of Data Science (co-organizer), 2017, 2018.

Major Initiatives:
Lead the formation of the **Algorithms and Randomness Center** and served as its founding director from Nov 2006 till April 2011. The center is housed in CoC (SCS), with the active participation of CoE (ISYE, ECE) and CoS (Math), drawing over 30 faculty from these schools. It has had a nearly weekly colloquium with mostly outside speakers over this period, hosted numerous workshops and visitors, and funded student research projects every year. ARC has a unique interactive lunch seminar where theoreticians from the center interact with scientists across campus to identify and work on problems that are interesting and relevant to both, leading to many fruitful collaborative efforts over the years.

Conceived and initiated **Computing-for-Good (C4G)** as a project-based service activity in 2008. The goal of C4G is to address pressing societal needs (poverty, health, shelter, education, access) using computing ideas. A course by the same name is taught every year with students working in teams with outside partners and aiming to deploy something useful by the end of the course. Many projects continue after the course as MS projects. Nearly 20 projects are currently deployed across the world from Atlanta to India and sub-Saharan Africa in collaboration with many organizations. Developed the necessary relationships with outside partners and actively helps support existing deployments. Several faculty have participated and committed time and efforts to this initiative.

Books:

The Random Projection Method, AMS, 2004 (reprinted 2006).

Spectral Algorithms, with Ravi Kannan, NOW, 2009.

Surveys:

"Geometric Random Walks: A Survey," MSRI volume on *Combinatorial and Computational Geometry*, Cambridge University Press, 2005 (invited).

"Recent Progress and Open Problems in Algorithmic Convex Geometry," Proc. of FSTTCS, 2010 (invited).

"The KLS Conjecture," (with Yin Tat Lee) *Current Developments in Mathematics*, 2017 (invited).

"Randomized Algorithms in Numerical Linear Algebra," (with Ravi Kannan) *Acta Numerica*, 2017 (invited).

Papers in Refereed Journals:

1. Andrew Kotlov, László Lovász and Santosh Vempala, "The Colin de Verdière Number and Sphere Representations of a Graph," **Combinatorica** 17(4), 483–521, 1997.
2. Avrim Blum, Alan Frieze, Ravi Kannan and Santosh Vempala, "A Polynomial-Time Algorithm for Learning Noisy Linear Threshold Functions," **Algorithmica,** 22(1), 35–52, 1998 (invited).
3. Baruch Awerbuch, Yossi Azar, Avrim Blum and Santosh Vempala, "New Approximation Guarantees for Minimum-Weight k-Trees and Prize-Collecting Salesmen," **SIAM J. on Computing** 28(1), 254–262, 1998.
4. Joseph S.B. Mitchell, Avrim Blum, Prasad Chalasani, and Santosh Vempala, "A Constant-Factor Approximation Algorithm for the Geometric k-MST Problem in the Plane," **SIAM J. on Computing** 28(3), 771–781, 1998.
5. Avrim Blum, R. Ravi and Santosh Vempala, "A Constant-Factor Approximation for the k-MST Problem," **J. Computer and System Sciences** 58(1), 101–108, 1999 (invited).
6. Ravi Kannan, Prasad Tetali and Santosh Vempala, "Simple Markov-Chain Algorithms for Generating Bipartite Graphs and Tournaments," **Random Structures and Algorithms** 14(4), 293–308, 1999.
7. Christos Papadimitriou, Prabhakar Raghavan, Hisao Tamaki and Santosh Vempala, "Latent Semantic Indexing: A Probabilistic Analysis," **J. Computer and System Sciences** 61(2), 217–235, 2000 (invited).

8. Avrim Blum, Goran Konjevod, R. Ravi and Santosh Vempala, "Semi-Definite Relaxation for Minimum Bandwidth and other Vertex-Ordering Problems," **Theoretical Computer Science** 235(1), 25–42, 2000 (invited).

9. Robert Carr and Santosh Vempala, "Randomized Meta-rounding," **Random Structures and Algorithms** 20(3), 343–352, 2002 (invited).

10. Adam Kalai and Santosh Vempala, "Efficient algorithms for universal portfolios," **J. Machine Learning Research** 3, 423–440, 2002 (invited).

11. Joseph Cheriyan, Santosh Vempala and Adrian Vetta, "An approximation algorithm for the minimum-cost k-vertex connected subgraph," **SIAM J. Computing**, 32(4), 1050–1055, 2003.

12. John Dunagan and Santosh Vempala, "Optimal outlier removal in high-dimensional spaces," **J. Computer and System Sciences** 68 (2), 335–373, 2004 (invited).

13. Claudson Bornstein and Santosh Vempala, "Flow metrics," **Theoretical Computer Science** 321(1), 13–24, 2004 (invited).

14. Petros Drineas, Ravi Kannan, Alan Frieze, Santosh Vempala and V. Vinay, "Clustering Large Graphs via the Singular Value Decomposition," **Machine Learning** 56, 9–33, 2004 (invited).

15. Grant Wang and Santosh Vempala, "A Spectral Algorithm for Learning Mixture Models," **J. Computer and System Sciences** 68(4), 841–860, 2004 (invited).

16. Robert Carr and Santosh Vempala, "On the Held-Karp Relaxation for the Asymmetric and Symmetric Traveling Salesman Problems," **Mathematical Programming** 100(3), 569–587, 2004.

17. Ravi Kannan, Santosh Vempala and Adrian Vetta, "On Clusterings: Good, Bad and Spectral," **Journal of the ACM** 51(3), 497–515, 2004.

18. Dimitris Bertsimas and Santosh Vempala, "Solving Convex Programs by Random Walks," **Journal of the ACM** 51(4), 540–556, 2004.

19. Ravi Kannan, Alan Frieze and Santosh Vempala, "Fast Monte-Carlo Algorithms for Finding Low-Rank Approximations," **Journal of the ACM** 51(6), 1025–1041, 2004.

20. Adam Kalai and Santosh Vempala, "Efficient Algorithms for the Online Decision Problem," **J. Computer and System Sciences** 71(3), 291–307, 2005 (invited).

21. Joseph Cheriyan, Santosh Vempala and Adrian Vetta, "Network Design via Iterative Rounding of Setpair Relaxations," **Combinatorica** 26(3), 255–275, 2006.

22. Rosa I. Arriaga and Santosh Vempala, "'An Algorithmic Theory of Learning: Robust Concepts and Random Projection," **Machine Learning** 63(2), 161–182, 2006.

23. Maria-Florina Balcan, Avrim Blum and Santosh Vempala, "Kernels as Features: On Kernels, Margins and Low-dimensional Mappings," **Machine Learning** 65(1), 79–94 (2006).

24. Christos Papadimitriou and Santosh Vempala, "On the Approximability of the Traveling Salesman Problem," **Combinatorica** 26(1), 101–120, 2006.

25. László Lovász and Santosh Vempala, "Simulated Annealing in Convex Bodies and an $O^*(n^4)$ Volume Algorithm," **J. Computer and System Sciences** 72(2), 392–417, 2006 (invited).

26. László Lovász and Santosh Vempala, "Hit-and-run from a Corner," **SIAM J. on Computing** 35(4), 985-1005, 2006 (invited).

27. Adam Kalai and Santosh Vempala, "Simulated Annealing for Convex Optimization," **Math. of OR** 31(2), 253–266, 2006.

28. Amit Deshpande, Luis Rademacher, Santosh Vempala and Grant Wang, "Matrix Approximation and Projective Clustering via Volume Sampling," **Theory of Computing** 2(12), 225–247, 2006.

29. David Cheng, Ravi Kannan, Grant Wang and Santosh Vempala, "A Divide-and-Merge Methodology for Clustering," **ACM Transactions on Database Systems** 31(4), 1499–1525, 2006 (invited).

30. László Lovász and Santosh Vempala: "The geometry of logconcave functions and sampling algorithms," **Random Struct. Algorithms**, 30(3), 307-358, 2007 (invited).

31. Imre Bárány, Santosh Vempala and Adrian Vetta: "Nash equilibria in random games," **Random Struct. Algorithms**, 31(4), 391-405, 2007 (invited).

32. John Dunagan and Santosh Vempala, "A Simple Polynomial-time Rescaling Algorithm for Solving Linear Programs," **Mathematical Programming**, 114(1), 101-114, 2008.

33. Luis Rademacher and Santosh Vempala: "Dispersion of Mass and the Complexity of Randomized Geometric Algorithms." **Advances in Mathematics**, 219(3), 1037-1069, 2008.

34. Ravindran Kannan, Hadi Salmasian and Santosh Vempala: "The Spectral Method for General Mixture Models." **SIAM J. Comput.**, 38(3), 1141-1156, 2008.

35. Dimitris Bertsimas, Margret V. Bjarnadöttir, Michael A Kane, J Christian Kryder, Rudra Pandey, Santosh Vempala and Grant Wang: "Algorithmic Prediction of Health-Care Costs." **Operations Research**, (special issue on Health Care), 56(6), 1382-1392, 2008.

36. S. C. Brubaker and S. S. Vempala: "Isotropic PCA and Affine-invariant Clustering." **Building Bridges** (special issue in honor of L. Lovász's 60th birthday), 241-282, 2008.

37. D. Štefankovič, Santosh Vempala and Eric Vigoda: "Adaptive simulated annealing: A near-optimal connection between sampling and counting." **J. ACM**, 56(3), 1-36, 2009.

38. A. Belloni, R. M. Freund and S. Vempala: "An Efficient Rescaled Perceptron Algorithm for Conic Systems." **Math. Oper. Res.**, 34(3): 621-641, 2009.

39. S. Vempala: "A random-sampling-based algorithm for learning intersections of halfspaces." **J. ACM**, 57(6), 2010.

40. D. Stefankovic, S. Vempala and Eric Vigoda: "A Deterministic Polynomial-Time Approximation Scheme for Counting Knapsack Solutions." **SIAM J. Comp.**, 41(2): 356-366, 2012.

41. S. Arora, L. Lovász, I. Newman, Y. Rabani, Y. Rabinovich and S. Vempala: "Local Versus Global Properties of Metric Spaces." **SIAM J. Comp.** 41(1): 250-271, 2012.

42. Santosh Vempala: Modeling High-dimensional Data: Technical Perspective. **Comm. ACM**, 55(2): 112, 2012 (invited).

43. Daniel Dadush and Santosh Vempala: "Near-optimal deterministic algorithms for volume computation via M-ellipsoids." **Proc. of National Academy of Sciences (PNAS)**, special issue on Quantitative Geometry (invited), published online September 2013.

44. Alan Frieze, Navin Goyal, Luis Rademacher and Santosh Vempala: "Expanders via Random Spanning Trees," **SIAM J. Comp**, 43(2): 497-513, 2014.

45. Navin Goyal, Luis Rademacher and Santosh Vempala: "Query Complexity of Sampling and Small Geometric Partitions," **Combinatorics, Probability & Computing** 24(5): 733-753, 2015.

46. Rosa I. Arriaga and Santosh Vempala: "Visual Categorization via Random Projection," **Neural Computation**, 27(10):2132-2147, 2015.

47. A. B. Dieker, Santosh Vempala: "Stochastic Billiards for Sampling from the Boundary of a Convex Set," **Math. Oper. Res.** 40(4): 888-901, 2015.

48. S. Artmann, F. Eisenbrand, C. Glanzer, T. Oertel, S. Vempala, R. Weismantel: A note on non-degenerate integer programs with small sub-determinants. **Oper. Res. Lett.** 44(5): 635-639, 2016.

49. Ben Cousins and Santosh Vempala: "A Practical Volume Algorithm," **Math. Prog. (C)**, 8(2): 133-160, 2016.

50. Karthekeyan Chandrasekaran, Laszlo Végh and Santosh Vempala: "The Cutting Plane Method is Polynomial for Perfect Matchings," **Math. of Oper. Res.**, 41(1): 23-48, 2016.

51. Vitaly Feldman, Elena Grigorescu, Lev Reyzin, Santosh Vempala, Ying Xiao, "Statistical Algorithms and the Complexity of Detecting Planted Cliques," **J. ACM**, 64(2): 8:1-37, 2017.

52. Friedrich Eisenbrand, Santosh Vempala: "Geometric random edge," **Math. Program.**, 164(1-2): 325-339, 2017.

53. Ben Cousins, Santosh Vempala: "Gaussian Cooling and O*(n3) Algorithms for Volume and Gaussian Volume," **SIAM J. Comp.**, 47(3): 1237-1273, 2018.

54. Vitaly Feldman, Will Perkins, and Santosh Vempala: "On the Complexity of Random Satisfiability Problems with Planted Solutions," **SIAM J. Comp.** 47(4): 1294-1338, 2018.

55. Christoph Hunkenschröder, Santosh S. Vempala, Adrian Vetta: "A 4/3-Approximation Algorithm for the Minimum 2-Edge Connected Subgraph Problem." **ACM Trans. Algorithms** 15(4): 55:1-55:28, 2019.

56. Wolfgang Maass, Christos H. Papadimitriou, Santosh S. Vempala, Robert A. Legenstein: "Brain Computation: A Computer Science Perspective."" **LNCS 10000: Computing and Software Science**, 184-199, 2019.

57. Manuel Blum and Santosh Vempala: "The complexity of human computation via a concrete model with an application to passwords," **Proc. of the National Academy of Sciences (PNAS)**, April 28, 2020 117 (17) 9208-9215.

58. Christos H. Papadimitriou, Santosh S. Vempala, Daniel Mitropolsky, Michael Collins, and Wolfgang Maass: "Brain computation by assemblies of neurons," **Proc. of the National Academy of Sciences (PNAS)**, June 23, 2020 117 (25) 14464-14472.

59. Greg Bodwin and Santosh S. Vempala, "A Unified View of Sparse Graph Regularity via Matrix Decompositions," **Random Structures and Algorithms**, 2021.

Proceedings of Refereed Conferences:
(includes 51 STOC/FOCS)

1. Naveen Garg, Aman Singla and Santosh Vempala, "Improved Approximation Algorithms for Biconnected Subgraphs via Better Lower Bounding Techniques," *Proc. 4th ACM-SIAM Symposium on Discrete Algorithms*, 1993.

2. Vivek Arora, Huzur Saran, Vijay Vazirani and Santosh Vempala, "A Limited-Backtrack Greedy Schema for Approximation Algorithms," *Proc. 14th Symposium on the Foundations of Software Technology and Theoretical Computer Science*, 1994.

3. J.S.B. Mitchell, A. Blum, P. Chalasani, and Santosh Vempala, "A Constant-Factor Approximation Algorithm for the Geometric k-MST Problem in the Plane," *Proc. 27th ACM Symposium on the Theory of Computing (***STOC***)*, 1995.

4. Baruch Awerbuch, Yossi Azar, Avrim Blum and Santosh Vempala, "Improved Approximations for Minimum-Weight k-Trees and Prize-Collecting Salesmen," *Proc. 27th ACM Symposium on the Theory of Computing (***STOC***)*, 1995.

5. Avrim Blum, R. Ravi and Santosh Vempala, "A Constant-Factor Approximation for the k-MST Problem," *Proc. 28th ACM Symposium on the Theory of Computing (***STOC***)*, 1996.

6. Avrim Blum, Alan Frieze, Ravi Kannan and Santosh Vempala, "A Polynomial-Time Algorithm for Learning Noisy Linear Threshold Functions," *Proc. 37th IEEE Symp. on the Foundations of Computer Science (***FOCS***)*, 1996.

7. Ravi Kannan, Prasad Tetali and Santosh Vempala, "Simple Markov-Chain Algorithms for Generating Bipartite Graphs and Tournaments," *Proc. 8th ACM-SIAM Symposium on Discrete Algorithms*, 1997.

8. Christos Papadimitriou, Prabhakar Raghavan, Hisao Tamaki and Santosh Vempala, "Latent Semantic Indexing: A Probabilistic Analysis," *Proc. of the 17th ACM Symposium on the Principles of Database Systems*, 1998.

9. Piotr Indyk, Rajeev Motwani, Prabhakar Raghavan, and Santosh Vempala, "Locality-Preserving Hashing in Multidimensional Spaces," *Proc. 29th ACM Symposium on the Theory of Computing (***STOC***)*, 1997.

10. Ravi Kannan and Santosh Vempala, "Sampling Lattice Points," *Proc. 29th ACM Symposium on the Theory of Computing (***STOC***)*, 1997.

11. Santosh Vempala, "A Random Sampling based Algorithm for learning the Intersection of Half-spaces," *Proc. of the 38th IEEE Foundations of Computer Science (***FOCS***)*, 1997.

12. Avrim Blum, Goran Konjevod, R. Ravi and Santosh Vempala, "Semi-Definite Relaxation for Minimum Bandwidth and other Vertex-Ordering Problems," *Proc. 30th ACM Symposium on the Theory of Computing (***STOC***)*, 1998.

13. Alan Frieze, Ravi Kannan and Santosh Vempala, "Fast Monte Carlo Algorithms for finding low-rank approximations," *Proc. 39th IEEE Symposium on the Foundations of Computer Science (***FOCS***)*, 1998.

14. Santosh Vempala, "Random Projection: A new approach to VLSI layout," *Proc. 39th IEEE Symposium on the Foundations of Computer Science (***FOCS***)*, 1998.

15. P. Drineas, Alan Frieze, Ravi Kannan, Santosh Vempala and V. Vinay, "Clustering in Large Graphs and Matrices," *Proc. 9th ACM-SIAM Symposium on Discrete Algorithms,* 1999.

16. Mihalis Yannakakis and Santosh Vempala, "A Convex Relaxation for the Asymmetric TSP," *Proc. 9th ACM-SIAM Symposium on Discrete Algorithms,* 1999.

17. Rosa I. Arriaga and Santosh Vempala, "An algorithmic theory of learning: Robust concepts and random projection," *Proc. 40th IEEE Symposium on the Foundations of Computer Science (***FOCS***)*, 1999.

18. Berthold Vocking and Santosh Vempala, "Approximating Multicast Congestion," *Proc. of International Symposium on Algorithms and Computation,* 1999.

19. Robert Carr and Santosh Vempala, "Towards a 4/3 approximation for the asymmetric traveling salesman problem," *Proc. 10th ACM-SIAM Symposium on Discrete Algorithms,* 2000.

20. Robert Carr and Santosh Vempala, "Randomized meta-rounding," Preliminary version in *Proc. 32nd ACM Symposium on the Theory of Computing (***STOC***)*, 2000.

21. Christos H. Papadimitriou and Santosh Vempala, "On the approximability of the traveling salesman problem," *Proc. 32nd ACM Symposium on the Theory of Computing (***STOC***)*, 2000.

22. Adrian Vetta and Santosh Vempala, "Factor 4/3 approximations for 2-connected subgraphs," *Proc. 3rd Workshop on Approximation Algorithms,* 2000.

23. Adam Kalai and Santosh Vempala, "Efficient algorithms for universal portfolios," *Proc. 41st IEEE Foundations of Computer Science (***FOCS***)*, 2000.

24. Ravi Kannan, Santosh Vempala and Adrian Vetta, "On clusterings: good, bad and spectral," *Proc. 41st IEEE Foundations of Computer Science (***FOCS***)*, 2000.

25. Joseph Cheriyan and Santosh Vempala, "Edge covers of setpairs and the iterative rounding method," *Proc. of Integer Programming and Combinatorial Optimization*, 2001.

26. Alantha Newman and Santosh Vempala, "Fences are futile: on relaxations for the linear ordering problem," *Proc. of Integer Programming and Combinatorial Optimization*, 2001.

27. John Dunagan and Santosh Vempala, "Optimal outlier removal in high-dimensional spaces," *Proc. of the 33rd ACM Symposium on the theory of computing (***STOC***)*, 2001.

28. John Dunagan and Santosh Vempala, "On Euclidean embeddings and bandwidth minimization," *Proc. of the 5th Intl. Symp. on Randomization and Approximation techniques in Computer Science*, 2001.

29. Claudson Bornstein and Santosh Vempala, "Flow metrics," *Proc. 5th Symp. on Latin American Theoretical Informatics*, 2002.

30. Dimitris Bertsimas and Santosh Vempala, "Solving convex programs by random walks," *Proc. 34th ACM Symp. on the Theory of Computing (***STOC***)*, 2002.

31. Joseph Cheriyan, Santosh Vempala and Adrian Vetta, "Approximation algorithms for minimum-cost k-connected subgraphs," *Proc. 34th ACM Symp. on the Theory of Computing (***STOC***)*, 2002.

32. Grant Wang and Santosh Vempala, "A spectral algorithm for learning mixtures of distributions," *Proc. 43rd IEEE Foundations of Computer Science (***FOCS***)*, 2002.

33. Adam Kalai and Santosh Vempala, "Efficient algorithms for the online decision problem," *Proc. of 16th Conf. on Computational Learning Theory*, 2003.

34. László Lovász and Santosh Vempala, "Logconcave functions: Geometry and efficient sampling algorithms," *Proc. of the 44th IEEE Foundations of Computer Science (***FOCS***)*, 2003.

35. László Lovász and Santosh Vempala, "Simulated Annealing in Convex Bodies and an $O^*(n^4)$ Volume Algorithm," *Proc. of the 44th IEEE Foundations of Computer Science (***FOCS***)*, 2003.

36. John Dunagan and Santosh Vempala, "A Simple Polynomial-time Rescaling Algorithm for Solving Linear Programs," *Proc. of the 36th ACM Symposium on the Theory of Computing (***STOC***)*, 2004.

37. László Lovász and Santosh Vempala, "Hit-and-run from a Corner," *Proc. of the 36th ACM Symposium on the Theory of Computing (***STOC***)*, 2004.

38. Nina Balcan, Avrim Blum and Santosh Vempala, "On Kernels, Margins and Low-dimensional Mappings," *Proc. of 15th Intl. Conference on Algorithmic Learning Theory*, 2004.

39. Luis Rademacher and Santosh Vempala, "Testing Geometric Convexity," *Proc. of the 24th Symposium on the Foundations of Software Technology and Theoretical Computer Science*, 2004.

40. W. Fernandez de la Vega, Ravi Kannan, Marek Karpinski and Santosh Vempala, "Tensor Decomposition and Approximation Schemes for Constraint Satisfaction Problems," *Proc. of the ACM Symposium on the Theory of Computing (***STOC***)*, 2005.

41. David Cheng, Ravi Kannan, Santosh Vempala and Grant Wang, "A Divide-and-Merge Methodology for Clustering," *Proc. of the 25th ACM Symposium on Principles of Database Systems*, 2005.

42. Ravi Kannan, Hadi Salmasian and Santosh Vempala, "The Spectral Method for General Mixture Models," *Proc. of 18th Conf. on Computational Learning Theory*, 2005. (Mark Fulk award).

43. Imre Bárány, Santosh Vempala and Adrian Vetta, "Nash Equilibria in Random Games," *Proc. of the 46th IEEE Foundations of Computer Science (***FOCS***)*, 2005.

44. Sanjeev Arora, László Lovász, Ilan Newman, Yuval Rabani and Santosh Vempala, "Local versus Global Properties of Metric Spaces," *Proc. ACM-SIAM Symposium on Discrete Algorithms,* 2006.

45. Amit Deshpande, Luis Rademacher, Santosh Vempala and Grant Wang, "Matrix Approximation and Projective Clustering via Volume Sampling," *Proc. ACM-SIAM Symposium on Discrete Algorithms,* 2006.

46. David Pritchard and Santosh Vempala, "Symmetric Network Computation," *Proc. ACM Symposium on Parallel Algorithms and Architectures,* 2006.

47. Amit Deshpande and Santosh Vempala, "Adaptive Sampling and Fast Low-Rank Approximation," *Proc. RANDOM*, 2006.

48. László Lovász and Santosh Vempala, "Fast Algorithms for Logconcave Functions: Sampling, Rounding, Integration and Optimization," *Proc. of the IEEE Foundations of Computer Science (***FOCS***)*, 2006.

49. Luis Rademacher and Santosh Vempala, "Dispersion of Mass and the Complexity of Randomized Geometric Algorithms," *Proc. of the IEEE Foundations of Computer Science (***FOCS***)*, 2006.

50. Alex Belloni, Robert Freund and Santosh Vempala, "An Efficient Re-scaled Perceptron Algorithm for Conic Systems," Proc. of Conf. Learning Theory, 2007.

51. Daniel Stefankovic, Santosh Vempala and Eric Vigoda, "Adaptive Simulated Annealing: A Near-optimal Connection between Sampling and Counting," *Proc. of the IEEE Foundations of Computer Science (***FOCS***)*, 2007.

52. Anirudh Ramachandra, Nick Feamster and Santosh Vempala, "Spam Filtering with Behavioral Blacklisting," ACM CCS 2007.

53. Murtaza Motiwala, Nick Feamster and Santosh Vempala, "Path Splicing: Reliable Connectivity with Rapid Recovery," ACM HotNets 2007.

54. Varun Kanade and Santosh Vempala, "Life (and Routing) on The Wireless Manifold," ACM HotNets 2007.

55. Nina Balcan, Avrim Blum and Santosh Vempala, "A Learning-Theoretic Framework for Clustering," *Proc. of the ACM Symposium on the Theory of Computing (***STOC***)*, 2008.

56. Alan Frieze, Santosh Vempala and Juan Vera, "Logconcave Random Graphs," *Proc. of the ACM Symposium on the Theory of Computing (***STOC***)*, 2008.

57. M. Motiwala, M. Elmore, N. Feamster and S. Vempala, "Path Splicing," *Proc. of SIGCOMM*, 2008.

58. S.C. Brubaker and S.S. Vempala, "Isotropic PCA and Affine-invariant Clustering," *Proc. of the IEEE Foundations of Computer Science (***FOCS***)*, 2008.

59. Navin Goyal, Luis Rademacher and Santosh Vempala, "Expanders via Random Spanning Trees," *Proc. ACM-SIAM Symposium on Discrete Algorithms,* 2009.

60. S. Thomas, B. Osuntogun, J. Pitman, B. Mulenga and S. Vempala, "Design and Deployment of a Blood Safety Monitoring System," *Proc. of ICTD*, 2009.

61. S. Charles Brubaker and Santosh Vempala: "Random Tensors and Planted Cliques". *Proc. of APPROX-RANDOM*, 2009.

62. Karthekeyan Chandrasekaran, Amit Deshpande and Santosh Vempala: "Sampling s-Concave Functions: The Limit of Convexity Based Isoperimetry," *Proc. of APPROX-RANDOM*, 2009.

63. Ashwin Paranjpe and Santosh Vempala, "MyMANET: A Customizable Mobile Ad hoc Network," *Proc. of ACM NSDR*, 2009.

64. Mihaly Bárász and Santosh Vempala: "A New Approach to Strongly Polynomial Linear Programming," *Proc. of ICS*, 2010.

65. Karthekeyan Chandrasekaran, Daniel Dadush and Santosh Vempala: "Thin Partitions: Isoperimetry and Sampling for Star-shaped Bodies," *Proc. of ACM-SIAM SODA*, 2010.

66. Pranjal Awasthi, Maria-Florina Balcan, Avrim Blum, Or Sheffet and Santosh Vempala: "On Nash-Equilibria of Approximation-Stable Games," *Proc. of SAGT*, 2010.

67. Sam Burnett, Nick Feamster and Santosh Vempala: "Chipping Away at Censorship Firewalls with User-Generated Content," *Proc. of USENIX Security*, 2010.

68. Santosh Vempala:"Learning Convex Concepts From Gaussian Distributions with PCA," *Proc. of the IEEE Foundations of Computer Science (***FOCS***)*, 2010.

69. Karthekeyan Chandrasekaran, Richard Karp, Eric Moreno-Centeno and Santosh Vempala: "Algorithms for Implicit Hitting Set Problems," *Proc. of ACM-SIAM SODA*, 2011.

70. Hrushikesh Mehendale, Ashwin Paranjpe, Santosh Vempala: "LifeNet: a flexible ad hoc networking solution for transient environments," *SIGCOMM* demo and short paper, 2011.

71. Brendan Juba, Santosh Vempala: "Semantic Communication for Simple Goals Is Equivalent to On-line Learning," *ALT*, 2011.

72. Elena Grigorescu, Lev Reyzin, Santosh Vempala: "On Noise-Tolerant Learning of Sparse Parities and Related Problems," *ALT*, 2011.

73. Anand Louis, Prasad Raghavendra, Prasad Tetali, Santosh Vempala: "Algorithmic Extensions of Cheeger's Inequality to Higher Eigenvalues and Partitions," *APPROX-RANDOM*, 2011.

74. Parikshit Gopalan, Adam Klivans, Raghu Meka, Daniel Stefankovic, Santosh Vempala, Eric Vigoda: "An FPTAS for # Knapsack and Related Counting Problems," *Proc. of the IEEE Foundations of Computer Science (***FOCS***)*, 2011.

75. Daniel Dadush, Chris Peikert, Santosh Vempala: "Enumerative Lattice Algorithms in any Norm Via M-ellipsoid Coverings," *Proc. of the IEEE Foundations of Computer Science (***FOCS***)*, 2011.

76. Daniel Dadush, Santosh Vempala: "Deterministic construction of an approximate M-ellipsoid and its applications to derandomizing lattice algorithms," *SODA*, 2012.

77. Anand Louis, Prasad Raghavendra, Prasad Tetali, Santosh Vempala: "Many sparse cuts via higher eigenvalues," *Proc. of the ACM Symposium on the Theory of Computing (***STOC***)*, 2012.

78. Karthekeyan Chandrasekara, László Végh, Santosh Vempala: "The cutting plane method is polynomial for perfect matchings," *Proc. of the IEEE Foundations of Computer Science (***FOCS***)*, 2012.

79. Santosh Vempala: "Randomly oriented k-d trees adapt to intrinsic dimension," *Proc. Foundations of Software Technology and Theoretical Computer Science*, 2012.

80. Noga Alon and Santosh Vempala: "The approximate rank of a matrix and its algorithmic applications," *Proc. of the ACM Symposium on the Theory of Computing (***STOC***)*, 2013.

81. Vitaly Feldman, Elena Grigorescu, Lev Reyzin, Santosh Vempala and Ying Xiao: "Statistical Algorithms and a lower bound for detecting planted cliques," *Proc. of the ACM Symposium on the Theory of Computing (***STOC***)*, 2013.

82. Anand Louis, Prasad Raghavendra, Santosh Vempala: "The complexity of approximating vertex expansion," *Proc. of the IEEE Foundations of Computer Science (***FOCS***)*, 2013.

83. Ben Cousins and Santosh Vempala: "A Cubic Algorithm for Gaussian Volume," *SODA*, 2014.

84. Karthekeyan Chandrasekaran and Santosh Vempala: "Integer feasibility of random polytopes," *Proc. of ITCS*, 2014.

85. Navin Goyal, Santosh Vempala and Ying Xiao: "Fourier PCA and Robust Tensor Decomposition," *Proc of the ACM Symposium on the Theory of Computing (***STOC***)*, 2014.

86. Ravi Kannan, Santosh Vempala and David Woodruff: "Principal Component Analysis and Higher Correlations for Distributed Data," *Proc. of COLT*, 2014.

87. Vitaly Feldman, Will Perkins and Santosh Vempala: "On the Complexity of Random Satisfiability Problems with Planted Solutions," *Proc of the ACM Symposium on the Theory of Computing (***STOC***)*, 2015.

88. Ben Cousins and Santosh Vempala: "Bypassing KLS: Gaussian Cooling and an $O^*(n^3)$ Volume Algorithm," *Proc of the ACM Symposium on the Theory of Computing (***STOC***)*, 2015.

89. M.F. Balcan, A. Blum and Santosh Vempala: "Efficient Representaitons for Lifelong Learning and Autoencoding," *Proc. of COLT*, 2015.

90. Ying Xiao and Santosh Vempala: "Max vs Min: Tensor Decomposition and ICA with nearly Linear Sample Complexity," *Proc. of COLT*, 2015.

91. Christos H. Papadimitriou and Santosh Vempala: "Cortical Learning via Prediction," *Proc. of COLT*, 2015.

92. Manuel Blum and Santosh Vempala: "Publishable Humanly Usable Secure Password Creation Schemas," *Proc. of HCOMP*, 2015.

93. Vitaly Feldman, Will Perkins and Santosh Vempala: "Subsampled Power Iteration: A Unified Algorithm for Block Models and Planted CSP's," *Proc. of NIPS*, 2015.

94. Santosh Vempala, Naomi Chopra, Aishwarya Rajagopal, John Nkengasong, Sidney Akuro: "C4G BLIS: Health Care Delivery via Iterative Collaborative Design in Resource-constrained Settings," Proc. of ICTD, 2016.

95. Christos H. Papadimitriou, Samantha Petti, Santosh Vempala: "Cortical Computation via Iterative Constructions," *Proc. of COLT*, 2016.

96. Anand Louis, Santosh Vempala: "Accelerated Newton Iteration for Roots of Black Box Polynomials," *Proc. of* **FOCS**, 2016.

97. Kevin A. Lai, Anup B. Rao, Santosh Vempala: "Agnostic Estimation of Mean and Covariance," *Proc. of* **FOCS**, 2016.

98. Vitaly Feldman, Cristobal Guzman, Santosh Vempala: "Statistical Query Algorithms for Stochastic Convex Optimization," *Proc. of* **SODA**, 2017.

99. Santosh Vempala and David Woodruff: "Adaptive Matrix Vector Product," *Proc. of* **SODA**, 2017.

100. Yin Tat Lee and Santosh Vempala: "Geodesic Walks in Polytopes," *Proc. of* **STOC**, 2017.

101. Ravi Kannan and Santosh Vempala: "The Hidden Hubs Problem," *Proc. of COLT*, 2017.

102. Yin Tat Lee and Santosh Vempala: "Eldan's Stochastic Localization and the KLS Hyperplane Conjecture: An Improved Lower Bound for Expansion," *Proc. of* **FOCS**, 2017.

103. Le Song, Santosh Vempala, John Wilmes, Bo Xie: "On the Complexity of Learning Neural Networks," *Proc. of NIPS*, 2017 (spotlight).

104. Robert A. Legenstein, Wolfgang Maass, Christos H. Papadimitriou, Santosh Srinivas Vempala: "Long Term Memory and the Densest K-Subgraph Problem," *Proc. of ITCS*, 2018.

105. Yin Tat Lee, Santosh S. Vempala: "Stochastic localization + Stieltjes barrier = tight bound for log-Sobolev", *Proc. of* **STOC**, 2018.

106. Yin Tat Lee, Santosh S. Vempala: "Convergence rate of riemannian Hamiltonian Monte Carlo and faster polytope volume computation," *Proc. of* **STOC**, 2018.

107. Samira Samadi, Santosh Vempala, Adam Tauman Kalai: "Usability of Humanly Computable Passwords," *Proc. of HCOMP*, 2018.

108. Yin Tat Lee, Aaron Sidford, Santosh S. Vempala: "Efficient Convex Optimization with Membership Oracles," *Proc. of COLT*, 2018.

109. Nima Anari, Constantinos Daskalakis, Wolfgang Maass, Christos H. Papadimitriou, Amin Saberi, Santosh Vempala: "Smoothed Analysis of Discrete Tensor Decomposition and Assemblies of Neurons," *Proc. of NeurIPS*, 2018.

110. Samira Samadi, Uthaipon Tao Tantipongpipat, Jamie H. Morgenstern, Mohit Singh, Santosh Vempala: "The Price of Fair PCA: One Extra dimension," *Proc. of NeurIPS*, 2018.

111. Christos H. Papadimitriou, Santosh S. Vempala: "Random Projection in the Brain and Computation with Assemblies of Neurons," *Proc. of ITCS*, 2019.

112. Santosh Vempala and John Wilmes: "Gradient Descent for One-Hidden-Layer Neural Networks: Polynomial Convergence and SQ Lower Bounds," *Proc. of COLT*, 2019.

113. Zongchen Chen and Santosh S. Vempala: "Optimal Convergence Rate of Hamiltonian Monte Carlo for Strongly Logconcave Distributions," *Proc. of APPROX-RANDOM*, 2019.

114. Uthaipon Tantipongpipat, Samira Samadi, Mohit Singh, Jamie Morgenstern, and Santosh Vempala: "Multi-Criteria Dimensionality Reduction with Applications to Fairness", *Proc. if NeurIPS*, 2019 (spotlight).

115. Santosh S. Vempala and Andre Wibisono: "Rapid Convergence of the Unadjusted Langevin Algorithm: Isoperimetry Suffices," *Proc. of NeurIPS*, 2019.

116. Jung Wook Park, Aditi Shah, Rosa I. Arriaga, Santosh S. Vempala: Redesigning a Basic Laboratory Information System for the Global South. *ITU Kaleidoscope*, 2019. (Best Paper)

117. Santosh S. Vempala, Ruosong Wang and David P. Woodruff: "The Communication Complexity of Optimization," *Proc. of SODA*, 2020.

118. Aditi Laddha, Yin Tat Lee and Santosh Vempala: "Strong Self-Concordance and Sampling," *Proc. of STOC*, 2020.

119. Richard Peng and Santosh Vempala: "Solving Sparse Linear Systems Faster than Matrix Multiplication," *Proc. of SODA*, 2021. (Best Paper)

120. Mehrdad Ghadiri, Samira Samadi and Santosh Vempala: "Socially Fair k-Means Clustering," *Proc. of FAccT*, 2021.

121. He Jia, Aditi Laddha, Yin Tat Lee and Santosh Vempala: "Reducing Isotropy and Volume to KLS: An $O^*(n^3\psi^2)$ Volume Algorithm," *Proc. of STOC*, 2021.

122. Aditi Laddha and Santosh Vempala: "Convergence of Gibbs Sampling: Coordinate Hit-and-Run Mixes Fast," *Proc. of SoCG*, 2021. (Invited to special issue).

Invited Keynotes and Tutorials

On clusterings — good, bad and spectral
PACT Theory day, Mar 2001.

Set-pair formulations for network design
Summer School, Integer Programming and Combinatorial Optimization (IPCO), May 2002.

Random walks and geometric algorithms
Mexican Mathematical Congress, Mexico, Oct 2002.

Lectures on Algorithmic Geometry
Andhra University, India, Aug 2005.
AIM workshop on Algorithmic Convex Geometry, Palo Alto, Nov 2007.
Summer school on Fourier analytic and probabilistic methods in geometric functional analysis and convexity, Kent State, Aug 2008.

Spectral algorithms and representations
Distinguished Lecturer Series, Computer Science Dept., UCSD, Oct 2005.
Keynote address, Encuentro Internacional de la Computacion, Mexico, Sep 2006.

Spectral Algorithms for Learning and Clustering
Plenary speaker, Conference on Learning Theory, San Diego, May 2007.
Plenary Speaker, First India Theory day, MSR Bangalore, Dec 2007.
Tutorial, New Algorithmic Paradigms in Optimization, Zurich, June 2008.
ACM SIGCOMM Tutorial, Seattle, Aug 2008.

Computing for Global Health
Plenary speaker, World AIDS Day, CDC, Dec 2008.

Spectral Algorithms mini-course
EPFL, Lausanne, June 2010.

Effective Principal Component Analysis
Kyoto prize satellite workshop, Tokyo, Nov 2010.
International Conference on Similarity Search and Applications, Toronto, Aug 2012.

Recent Progress and Open Problems in Algorithmic Convex Geometry
Plenary lecture, FSTTCS, Chennai, Dec 2010.

The Algorithmic Frontier of Convex Geometry
Algorithmic Frontiers workshop, EPFL, June 2012.

On the Complexity of Integer Programming
Plenary lecture, Mathematical Optimization: Theory and Applications, Lehigh, Aug 2012.

High-dimensional Sampling Algorithms
Machine Learning Summer School, Kyoto, Sep 2012.

Algoritmos Espectrales y sus Aplicaciones
Escuela Regional de Tecnologias de la Informacion y Comunicacion (ERTIC), Asuncion, Paraguay, Sep 2012.

On the Complexity of Detecting Planted Cliques and other Latent Structures
Discrete Math day, WPI, April 2013.

High-dimensional Sampling Algorithms and their Applications
Keynote speaker, International Conference on Machine Learning (ICML), June 2013.
Plenary speaker, APPROX-RANDOM, August 2013.

On the Complexity of Graph and Hypergraph Expansion Problems
Plenary speaker, SIAM Biennial conference on Discrete Mathematics, June 2014.

Algorithmic Aspects of Convexity
Winter course (10 hours), Institute Henri Poincare, Paris, Jan 2015.

On the Complexity of Unsupervised Learning
Tutorial, Indo-US Symposium on Learning, Algorithms and Complexity, Jan 2015.

Gaussian Cooling and Randomized Volume Computation
Plenary lecture, Simons collaboration on Geometry and Algorithms, May 2015.

On the Complexity of Detecting Planted Solutions
RSA FriezeFest, July 2015.

Human Computation and the Zen of Passwords
SCS Distinguished lecture, CMU, Feb 2016.

The Interplay of Sampling and Optimization in High Dimension
Joint STOC/SoCG keynote, June 2016.

Brain Computation: A CS Perspective
Simons-NCBS workshop on the interface of Biology and Theoretical Computer Science, Dec 2016.

Cálculo del Volumen an Dimensión Alta
Course at the Valparaiso Summer School on Discrete Math, Jan 2017.

Unsupervised Learning
Tutorial, Simons semester on Brain and Computation, Jan 2018.

The Complexity of Training a Neural Network
Distinguished Lecture, IISc, Bangalore, Feb 2018.

The KLS Conjecture
Harvard-MIT conference on Current Developments in Mathematics, Nov 2017.
Buidling Bridges II, László Lovász's 70th birthday conference, July 2018.

High-dimensional Geometry and Concentration
Tutorial, Simons semester on Foundations of Data Science, Aug 2018.

Continuous Algorithms
Plenary lecture. FSTTCS, Ahmedabad, Dec 2018.

How to Model Very Large Graphs
Simons Centre for the Study of Living Machines, Bangalore, Feb 2018.

Computational Theories of Brain
Papafest, Christos Papadimitriou's 70th birthday conference, NYC, Sep 2018.

From Machine Learning to the Brain and back
HDSI Distinguished Lecture, UC San Diego, Dec 2019.

The Communication Complexity of Optimization
Highlights of Algorithms, Aug 2020.

Computing in the Brain
FOCS 2020 tutorial, Nov 2020.

Solving Sparse Linear Systems Faster than Matrix Multiplication
Highlights of Algorithms, June 2021.