

Amit Chakrabarti

Curriculum Vitae
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Professor
Department of Computer Science
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Research Interests

- **Complexity theory**, with an emphasis on **lower bounds** in concrete models of computation.
- **Algorithms**, especially for the **efficient processing of big data** under space and communication restrictions, and coping with computational hardness via **approximation**.

Education

- **Ph.D.** in Computer Science, Princeton University, Nov 2002
Thesis Title: Limitations of Non-Uniform Computational Models
Advisor: Bernard Chazelle
- **M.A.** in Computer Science, Princeton University, Jun 1999
- **B.Tech.** in Computer Science & Engineering, Indian Institute of Technology (IIT), Bombay, Aug 1997

Professional Experience

2015–present: Professor, Department of Computer Science, Dartmouth College.

2009–2015: Associate Professor (with tenure), Department of Computer Science, Dartmouth College.

2003–2009: Assistant Professor, Department of Computer Science, Dartmouth College.

Apr 2015: Visiting Scientist, Simons Institute for the Theory of Computing, University of California, Berkeley, CA.

Feb 2014: Visiting Researcher, Microsoft Research India, Bangalore, India.

Aug–Dec 2013: Visiting Scientist, Simons Institute for the Theory of Computing, University of California, Berkeley, CA.

Aug 2010: Visiting Associate Professor, Centre for Quantum Technologies, National University of Singapore, Singapore.

July 2010: Visiting Researcher, Microsoft Research India, Bangalore, India.

Feb 2008: Visiting Assistant Professor, Department of Computer Science, University of Texas, Austin, TX.

August 2007: Visiting Researcher, AT&T Labs – Research, Florham Park, NJ.

July 2007: Visiting Researcher, DIMACS (Rutgers University) and Google Labs, New York, NY.

May–Jun 2007: Visiting Researcher, IBM Almaden Research Center, San Jose, CA.

Jan–May 2007: Visiting Assistant Professor, Department of Computer Science and Engineering, University of Washington, Seattle, WA.

August 2006: Visiting Researcher, IBM Almaden Research Center, San Jose, CA.

June–July 2005: Visiting Assistant Professor, Department of Computer Science and Software Engineering, University of Melbourne, Australia.

August 2004: Visiting Researcher, IBM Almaden Research Center, San Jose, CA.

2002–2003: Postdoctoral Fellow, School of Mathematics, Institute for Advanced Study, Princeton, NJ.

1999–2002: Research Assistant, Princeton University, Princeton, NJ.

Summer 2001: Summer intern at Bell Laboratories, Murray Hill, NJ. Worked in the Computing Sciences Research Center.

Summer 2000: Summer manager at AT&T Labs – Research, Florham Park, NJ. Worked in the Algorithms and Optimization Department.

1997–2000: Teaching Assistant, Princeton University, Princeton, NJ. Work spanned five undergraduate courses.

Summer 1996: Summer intern at IBM India Limited (formerly TISL), Bangalore, India. Worked in the PowerPC architecture group.

Fall 1995: Teaching Assistant, IIT Bombay, Mumbai, India.

Awards and Honors

- Royal Society (UK) Wolfson Research Merit Award, 2017 (declined).
- Friedman Family Fellowship, 2015–2016.
- Dartmouth College Senior Faculty Fellowship, Fall 2013.
- McLane Family Fellowship, 2009–2010.
- Karen E. Wetterhahn Memorial Award for Distinguished Creative or Scholarly Achievement, 2009.
- Dartmouth College Junior Faculty Fellowship, Spring 2007.
- National Science Foundation CAREER Award, 2005.
- Postdoctoral Fellow, School of Mathematics, Institute for Advanced Study, 2002–2003.
- DIMACS Summer Research Fellow, 1998.
- President of India Gold Medalist of IIT Bombay's Class of 1997.
- Silver Medalist at the International Mathematical Olympiad, 1993.

Research Support

- National Science Foundation, “Data Streaming with a View towards Cloud Computing,” \$300,000. Sep 2016 – Aug 2018.
- National Science Foundation, “Foundational Research in Communication Complexity and Its Applications,” \$440,000. Sep 2012 – Aug 2016.
- Neukom Institute (Dartmouth College) CompX Faculty Grant, “Efficient representations of configuration spaces for robot motion planning,” \$20,000. Mar 2012 – Feb 2013.
- Dartmouth College Senior Faculty Fellowship, \$700. Sep–Dec 2013.
- National Science Foundation, “Data Streaming through a Complexity-Theoretic Lens,” \$336,456. Aug 2009 – Jul 2013.
- McLane Family Fellowship, \$1,500. Jul 2009 – Jun 2010.
- National Science Foundation CAREER Award, “Information Theoretic Methods in Communication and Computational Complexity,” \$400,000. Jul 2005 – Jun 2010.
- Dartmouth College Junior Faculty Fellowship, \$700. Apr–Jun 2007.
- Dartmouth College Burke Award, \$20,000. Aug 2003 – Jun 2009.
- Dartmouth College Startup Award, \$130,000. Aug 2003 – Jun 2010.

Publications

A. In International Journals

- [J1] “Certifying Equality With Limited Interaction,” (with J. Brody, R. Kondapally, D. P. Woodruff, G. Yaroslavtsev), *Algorithmica*, **76**(3), 2016, pp. 796–845.
- [J2] “Robust Lower Bounds for Communication and Stream Computation,” (with G. Cormode, A. McGregor), *Theory of Computing*, **12**, Art. No. 10, 2016, pp. 1–35.
- [J3] “Submodular Maximization Meets Streaming: Matchings, Matroids, and More,” (with S. Kale), *Mathematical Programming, Series B*, **154**(1–2), 2015, pp. 225–247.
- [J4] “A Fast Online Spanner for Roadmap Construction,” (with W. Wang, D. Balkcom), *International Journal of Robotics Research*, **34**(11), 2015, pp. 1418–1432.
- [J5] “Annotations in Data Streams,” (with G. Cormode, A. McGregor, J. Thaler), *ACM Transactions on Algorithms*, **11**(1), Art. No. 7, 2014.
- [J6] “Information Cost Tradeoffs for Augmented Index and Streaming Language Recognition,” (with G. Cormode, R. Kondapally, A. McGregor), *SIAM Journal on Computing*, **42**(1), 2013, pp. 61–83.
- [J7] “An Optimal Lower Bound on the Communication Complexity of Gap-Hamming-Distance,” (with O. Regev), *SIAM Journal on Computing*, **41**(5), 2012, pp. 1299–1317.
- [J8] “A Note on Randomized Streaming Space Bounds for the Longest Increasing Subsequence Problem,” (sole author), *Information Processing Letters*, **112**(7), 2012, pp. 261–263.
- [J9] “An improved approximation algorithm for resource allocation,” (with G. Calinescu, H. Karloff, Y. Rabani), *ACM Transactions on Algorithms*, **7**(4), Art. No. 48, Sep 2011.
- [J10] “The Query Complexity of Estimating Weighted Averages,” (with V. Guruswami, A. Wirth, A. Wirth), *Acta Informatica*, **48**(7), 2011, pp. 417–426.

- [J11] “Combinatorial Theorems about Embedding Trees on the Real Line,” (with S. Khot), *Journal of Graph Theory*, **67**(2), 2011, pp. 153–168.
- [J12] “An Optimal Randomized Cell Probe Lower Bound for Approximate Nearest Neighbor Searching,” (with O. Regev), *SIAM Journal on Computing*, **39**(5), 2010, pp. 1919–1940.
- [J13] “A Near-Optimal Algorithm for Estimating the Entropy of a Stream,” (with G. Cormode, A. McGregor), *ACM Transactions on Algorithms*, **6**(3), Art. No. 51, Jun 2010.
- [J14] “Improved Lower Bounds on the Randomized Complexity of Graph Properties,” (with S. Khot), *Random Structures and Algorithms*, **30**(3), 2007, pp. 427–440.
- [J15] “Approximation Algorithms for the Unsplittable Flow Problem,” (with C. Chekuri, A. Gupta, A. Kumar), *Algorithmica*, **47**(1), 2007, pp. 53–78.
- [J16] “Estimating Entropy and Entropy Norm on Data Streams,” (with K. Do Ba, S. Muthukrishnan), *Internet Mathematics*, **3**(1), 2006, pp. 63–78.
- [J17] “A Lower Bound on the Complexity of Approximate Nearest Neighbor Searching on the Hamming Cube,” (with B. Chazelle, B. Gum, A. Lvov), *Discrete and Computational Geometry: The Goodman-Pollack Festschrift*, Springer-Verlag, 2003, pp. 313–328.
- [J18] “Evasiveness of Subgraph Containment and Related Properties,” (with S. Khot, Y. Shi), *SIAM Journal on Computing*, **31**(3), 2002, pp. 866–875.

B. In Proceedings of Refereed International Conferences

- [C1] “Towards Tighter Space Bounds for Counting Triangles and Other Substructures in Graph Streams,” (with S. K. Bera), *STACS 2017, the 34th International Symposium on Theoretical Aspects of Computer Science*, 2017, pp. 11:1–11:14.
- [C2] “Strong Fooling Sets for Multi-player Communication with Applications to Deterministic Estimation of Stream Statistics,” (with S. Kale), *FOCS 2016, the 57th Annual IEEE Symposium on Foundations of Computer Science*, 2016, pp. 41–50.
- [C3] “Incidence Geometries and the Pass Complexity of Semi-Streaming Set Cover,” (with A. Wirth), *SODA 2016, the 27th Annual ACM-SIAM Symposium on Discrete Algorithms*, 2016, pp. 1365–1373.
- [C4] “On Density, Threshold and Emptiness Queries for Intervals in the Streaming Model,” (with A. Bishnu, S. Nandy, S. Sen), *FSTTCS 2015, the 35th IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science*, 2015, pp. 336–349.
- [C5] “A Depth-Five Lower Bound for Iterated Matrix Multiplication,” (with S. K. Bera), *CCC 2015, the 30th Annual IEEE Conference on Computational Complexity*, 2015, pp. 183–197.
- [C6] “Verifiable Stream Computation and Arthur–Merlin Communication,” (with G. Cormode, A. McGregor, J. Thaler, S. Venkatasubramanian), *CCC 2015, the 30th Annual IEEE Conference on Computational Complexity*, 2015, pp. 217–243.
- [C7] “Certifying Equality With Limited Interaction,” (with J. Brody, R. Kondapally, D. P. Woodruff, G. Yaroslavtsev), *RANDOM-APPROX 2014, the 18th International Workshop on Randomization and Approximation Techniques in Computer Science*, 2014, pp. 545–581.
- [C8] “Beyond Set Disjointness: The Communication Complexity of Finding the Intersection,” (with J. Brody, R. Kondapally, D. P. Woodruff, G. Yaroslavtsev), *PODC 2014, the 33rd Annual ACM Symposium on Principles of Distributed Computing*, 2014, pp. 106–113.
- [C9] “Submodular Maximization Meets Streaming: Matchings, Matroids, and More,” (with S. Kale), *IPCO 2014, the 17th International Conference on Integer Programming and Combinatorial Optimization*, 2014, pp. 210–221.
- [C10] “Annotations for Sparse Data Streams,” (with G. Cormode, N. Goyal, J. Thaler), *SODA 2014, the 25th Annual ACM-SIAM Symposium on Discrete Algorithms*, 2014, pp. 687–706.

- [C11] “A Fast Streaming Spanner Algorithm for Incrementally Constructing Sparse Roadmaps,” (with W. Wang, D. Balkcom), *IROS 2013, the 26th IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2013, pp. 1257–1263.
- [C12] “Information Complexity versus Corruption and Applications to Orthogonality and Gap-Hamming,” (with R. Kondapally, Z. Wang), *RANDOM-APPROX 2012, the 16th International Workshop on Randomization and Approximation Techniques in Computer Science*, 2012, pp. 483–494.
- [C13] “When the Cut Condition is Enough: A Complete Characterization for Multiflow Problems in Series-Parallel Networks,” (with L. Fleischer, C. Weibel), *STOC 2012, the 44th Annual ACM Symposium on the Theory of Computing*, 2012, pp. 19–26.
- [C14] “Everywhere-Tight Information Cost Tradeoffs for Augmented Index,” (with R. Kondapally), *RANDOM-APPROX 2011, the 15th International Workshop on Randomization and Approximation Techniques in Computer Science*, 2011, pp. 448–459.
- [C15] “An Optimal Lower Bound on the Communication Complexity of Gap-Hamming-Distance,” (with O. Regev), *STOC 2011, the 43rd Annual ACM Symposium on the Theory of Computing*, 2011, pp. 51–60. Invited to STOC 2011 special issue by *SIAM Journal on Computing*.
- [C16] “Information Cost Tradeoffs for Augmented Index and Streaming Language Recognition,” (with G. Cormode, R. Kondapally, A. McGregor), *FOCS 2010, the 51st Annual IEEE Symposium on Foundations of Computer Science*, 2010, pp. 387–396.
- [C17] “Better Gap-Hamming Lower Bounds via Better Round Elimination,” (with J. Brody, O. Regev, T. Vidick, R. de Wolf), *RANDOM-APPROX 2010, the 14th International Workshop on Randomization and Approximation Techniques in Computer Science*, 2010, pp. 476–489.
- [C18] “A Multi-Round Communication Lower Bound for Gap Hamming and Some Consequences,” (with J. Brody), *CCC 2009, the 24th Annual IEEE Conference on Computational Complexity*, 2009, pp. 358–368.
- [C19] “Annotations in Data Streams,” (with G. Cormode, A. McGregor), *ICALP 2009, the 36th International Colloquium on Automata, Languages and Programming*, Lecture Notes in Computer Science **5555**, Springer-Verlag, 2009, pp. 222–234.
- [C20] “Functional Monitoring Without Monotonicity,” (with C. J. Arackaparambil, J. Brody), *ICALP 2009, the 36th International Colloquium on Automata, Languages and Programming*, Lecture Notes in Computer Science **5555**, Springer-Verlag, 2009, pp. 95–106.
- [C21] “Embeddings, Cuts, and Flows in Topological Graphs: Lossy Invariants, Linearization, and 2-Sums,” (with A. Jaffe, J. R. Lee, J. Vincent), *FOCS 2008, the 49th Annual Symposium on Foundations of Computer Science*, 2008, pp. 761–770.
- [C22] “Robust Lower Bounds for Communication and Stream Computation,” (with G. Cormode, A. McGregor), *STOC 2008, the 40th Annual ACM Symposium on Theory of Computing*, pp. 641–649.
- [C23] “Sublinear Communication Protocols for Multi-Party Pointer Jumping and a Related Lower Bound,” (with J. Brody), *STACS 2008, the 25th Annual Symposium on Theoretical Aspects of Computer Science*, 2008, pp. 145–156.
- [C24] “Tight Lower Bounds for Selection in Randomly Ordered Streams,” (with T. S. Jayram, M. Pătraşcu), *SODA 2008, the 19th Annual ACM-SIAM Symposium on Discrete Algorithms*, 2008, pp. 720–729. Invited to SODA 2008 special issue by *ACM Transactions on Algorithms*.
- [C25] “Nearly Private Information Retrieval,” (with A. Shubina), *MFCS 2007, the 32nd International Symposium on Mathematical Foundations of Computer Science*, Lecture Notes in Computer Science **4708**, Springer-Verlag, 2008, pp. 383–393.
- [C26] “Lower Bounds for Multi-Player Pointer Jumping,” (sole author), *CCC 2007, the 22nd Annual IEEE Conference on Computational Complexity*, 2007, pp. 33–45.

- [C27] “A Near-Optimal Algorithm for Computing the Entropy of a Stream,” (with G. Cormode, A. McGregor), *SODA 2007, the 18th Annual ACM-SIAM Symposium on Discrete Algorithms*, 2007, pp. 328–335.
- [C28] “Attack Detection in Time Series for Recommendation Systems,” (with S. Zhang, J. Ford, F. Makedon), in *Proceedings of the 12th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*, 2006, pp. 809–814.
- [C29] “A Quasi-PTAS for Unsplittable Flow on Line Graphs,” (with N. Bansal, A. Epstein, B. Schieber), *STOC 2006, the 38th Annual ACM Symposium on Theory of Computing*, 2006, 721–729.
- [C30] “Estimating Entropy and Entropy Norm on Data Streams,” (with K. Do Ba, S. Muthukrishnan), *STACS 2006, the 23rd Annual Symposium on Theoretical Aspects of Computer Science*, Lecture Notes in Computer Science **3884**, Springer-Verlag, 2006, pp. 196–205.
- [C31] “An Optimal Randomised Cell Probe Lower Bound for Approximate Nearest Neighbour Searching,” (with O. Regev), *FOCS 2004, the 45th Annual Symposium on Foundations of Computer Science*, 2004, pp. 473–482. Invited to FOCS 2004 special issue by *SIAM Journal on Computing*.
- [C32] “ R^* -Histograms: Efficient Representation of Spatial Relations between Objects of Arbitrary Topology,” (with Y. Wang, F. Makedon), in *Proceedings of the 12th Annual ACM International Conference on Multimedia*, 2004, pp. 356–359.
- [C33] “Near-Optimal Lower Bounds on the Multi-Party Communication Complexity of Set Disjointness,” (with S. Khot, X. Sun), *CCC 2003, the 18th Annual IEEE Conference on Computational Complexity*, 2003, pp. 97–107.
- [C34] “Approximation Algorithms for the Unsplittable Flow Problem,” (with C. Chekuri, A. Gupta, A. Kumar), *APPROX 2002, the 5th International Workshop on Approximation Algorithms for Combinatorial Optimization*, Lecture Notes in Computer Science **2462**, Springer-Verlag, 2002, pp. 51–66.
- [C35] “Improved Approximation Algorithms for Resource Allocation,” (with G. Calinescu, H. Karloff, Y. Rabani), *IPCO 2002, the 9th Conference on Integer Programming and Combinatorial Optimization*, Lecture Notes in Computer Science **2337**, Springer-Verlag, 2002, pp. 401–414.
- [C36] “Informational Complexity and the Direct Sum Problem for Simultaneous Message Complexity,” (with Y. Shi, A. Wirth, A. C.-C. Yao), *FOCS 2001, the 42nd Annual Symposium on Foundations of Computer Science*, 2001, pp. 270–278.
- [C37] “Improved Lower Bounds on the Randomized Complexity of Graph Properties,” (with S. Khot), *ICALP 2001, the 28th International Colloquium on Automata, Languages and Programming*, Lecture Notes in Computer Science **2076**, Springer-Verlag, 2001, pp. 285–296.
- [C38] “Evasiveness of Subgraph Containment and Related Properties,” (with S. Khot, Y. Shi), *STACS 2001, the 18th Annual Symposium on Theoretical Aspects of Computer Science*, Lecture Notes in Computer Science **2010**, Springer-Verlag, 2001, pp. 110–120.
- [C39] “A Lower Bound on the Complexity of Approximate Nearest Neighbor Searching on the Hamming Cube,” (with B. Chazelle, B. Gum, A. Lvov), *STOC 1999, the 31st Annual ACM Symposium on Theory of Computing*, 1999, pp. 305–311.

C. Other Refereed and Invited Articles

- [A1] “A conjecture regarding optimality of the dictator function under Hellinger distance,” (with V. Anantharam, A. Bogdanov, T. S. Jayram, C. Nair), *ITA 2017, the Information Theory and Applications Workshop*, 2017.
- [A2] “Communication Complexity,” in *Encyclopedia of Algorithms, Second Edition*, Springer, 2016, pp. 349–357.

D. Technical Reports and Other Writings

- [O1] “Time-Space Tradeoffs for the Memory Game,” (with Y. Chen), Technical Report ArXiv e-prints 1712.01330, 2017. Also under review for CCC 2018.
- [O2] “Data Stream Algorithms,” Lecture Notes (evolving draft), available online at <http://www.cs.dartmouth.edu/~ac/Teach/data-streams-lectnotes.pdf>.
- [O3] “You Can’t Do That: Lower Bounds in Computer Science,” Lecture Notes (evolving draft), available online at <http://www.cs.dartmouth.edu/~ac/Teach/lower-bounds-lectnotes.pdf>.
- [O4] Special Issue “Conference on Computational Complexity 2008” Guest Editors’ Foreword, (with P. Beame), *Computational Complexity* **18**(2), 2009, pp. 169–170.
- [O5] “Approximability of the Unsplittable Flow Problem on Trees,” (with C. J. Arackaparambil, C.-C. Huang), Technical Report TR2009-642, Computer Science, Dartmouth College, 2009.
- [O6] “Randomized Graph Partitioning Algorithms,” Senior Thesis, IIT Bombay, 1997.
- [O7] “Algorithms in Invariant Theory,” Junior Thesis, IIT Bombay, 1996.

E. Articles in Preparation

- [P1] “Parameter Estimation for Distributed, Non-Gaussian Data” (working title; with M. Jin).
- [P2] “On The Multilinear Degree of Minterm-Cyclic Boolean Functions,” (with S. Elizalde and E. Talmage).
- [P3] “Sensitivity versus Block Sensitivity: On the Optimality of Rubinstein’s Function,” (with K. Seth).

Patents and Patent Applications

- [X1] “Verification Of Data Stream Computations Using Third-Party-Supplied Annotations,” Patent number US8799754 B2, granted Aug 2014. <http://www.google.com/patents/US8799754>
- [X2] “Validation of Priority Queue Processing,” Patent number US8612649 B2, granted Dec 2013. <http://www.google.com/patents/US8612649>

Invited Talks

A. At Special-Focus Workshops and Conferences

- Mar 2018 “Counting Triangles and Other Substructures in Graph Streams,” Workshop on Data Summarization, University of Warwick, UK
- Jun 2017 “Deterministic versus Randomized Streaming: A New Technique for Communication Lower Bounds,” NII Shonan Workshop on Processing Big Data Streams, Shonan Village Center, Japan
- Mar 2017 “Strong Lower Bounds for Multi-Party Equality with Applications,” BIRS Workshop on Communication Complexity and Applications, Banff, Canada
- Mar 2017 “Organizer’s Opening Remarks,” BIRS Workshop on Communication Complexity and Applications, Banff, Canada
- Jun 2016 “Strong Lower Bounds for Multi-Party Equality with Applications,” Simons Institute Information Theory Reunion workshop, U. C. Berkeley, CA
- Mar 2016 “Overview of Communication Complexity,” Program on Nexus of Information and Computation Theories, Institut Henri Poincaré, Paris, France

- Jan 2016 “*Streaming Set Cover*,” Sublinear Algorithms Workshop, Johns Hopkins University, Baltimore, MD
- Aug 2015 “*Optimization While Streaming*,” DIMACS Workshop on Big Data through the Lens of Sublinear Algorithms, Rutgers University, Piscataway, NJ
- Apr 2015 “*Streaming Interactive Proofs and Arthur-Merlin Communication*,” Simons Institute workshop on Information Theory in Complexity Theory and Combinatorics, U. C. Berkeley, CA
- Feb 2015 “*Information Complexity of Fundamental Communication Games*,” 10th International Workshop on Information Theory and Applications (ITA 2015), San Diego, CA
- Oct 2014 “*Maximum Matching (and Generalizations) on Graph Streams*,” NII Shonan Workshop on Algorithms for Large Scale Graphs, Shonan Village Center, Japan
- Aug 2014 “*Organizer’s Opening Remarks*,” BIRS Workshop on Communication Complexity and Applications, Banff, Canada
- May 2014 “*Submodular Maximization in a Data Streaming Setting*,” Sublinear Algorithms Workshop, University Residential Centre, Bertinoro, Italy
- Apr 2014 “*Streaming Interactive Proofs or: How I Learned to Stop Worrying and Trust the Cloud*,” Sublinear Algorithms Day, ICERM, Brown University, Providence, RI
- Mar 2014 “*Arthur, Merlin, and Data Stream Computation*,” Dagstuhl Workshop on Computational Complexity of Discrete Problems, Schloss Dagstuhl, Germany
- Aug 2013 “*Certifying Equality With Limited Interaction*,” Workshop on Coding, Complexity and Sparsity (SPARC) 2013, University of Michigan, Ann Arbor, MI
- Jun 2013 “*What Can’t We Compute on Data Streams?*,” Big Data Analytics 2013, Microsoft Research, Cambridge, UK
- May 2013 “*Applications of information complexity I*,” Tutorial at workshop on Information Complexity and Applications, STOC 2013, Palo Alto, CA
- Feb 2013 “*Certifying Equality With Limited Interaction*,” 8th International Workshop on Information Theory and Applications (ITA 2013), San Diego, CA
- Aug 2012 “*The Gap-Hamming-Distance Story*,” Workshop on Coding, Complexity and Sparsity 2012, University of Michigan, Ann Arbor, MI
- Jul 2012 “*Why data stream researchers should learn Talagrand’s inequality*,” Workshop on Algorithms for Data Streams 2012, Technische Universität Dortmund, Germany
- Feb 2012 “*Everywhere-tight information cost tradeoffs for augmented index*,” 7th International Workshop on Information Theory and Applications (ITA 2012), San Diego, CA
- Jun 2011 “*The Information Complexity Paradigm*,” Workshop on Synergies in Lower Bounds, MADALGO, Aarhus University, Aarhus, Denmark
- May 2011 “*Gap-Hamming-Distance: the Journey to an Optimal Lower Bound*,” Sublinear Algorithms Workshop, University Residential Centre, Bertinoro, Italy
- Jan 2011 “*Information cost tradeoffs for augmented index and streaming language recognition*,” 6th International Workshop on Information Theory and Applications (ITA 2011), San Diego, CA
- Aug 2010 “*An optimal lower bound for the Gap-Hamming-Distance problem*,” ICM 2010 Satellite Conference On Algebraic and Probabilistic Aspects of Combinatorics and Computing, I.I.Sc., Bangalore, India
- Jan 2010 “*Better Gap-Hamming Lower Bounds via Better Round Elimination*,” 5th International Workshop on Information Theory and Applications (ITA 2010), San Diego, CA
- Dec 2009 “*Round Elimination Methods for Data Stream Lower Bounds*,” Workshop on Algorithms for Processing Massive Data Sets (WAPMDS), IIT Kanpur, India

- Mar 2009 *“Lower Bounds for Gap-Hamming-Distance and Consequences for Data Stream Algorithms,”* DIMACS/DyDAn Workshop on Streaming, Coding, and Compressive Sensing, Rutgers University, Piscataway, NJ
- Feb 2009 *“Functional Monitoring Without Monotonicity,”* 4th International Workshop on Information Theory and Applications (ITA 2009), San Diego, CA
- Jan 2009 *“Cell Probe Lower Bounds for Approximate Nearest Neighbour Searching,”* BIRS Workshop on Mathematics of String Spaces and Algorithmic Applications, Banff, Canada
- Aug 2008 *“Robust Communication Complexity and Random-Order Data Streams,”* Workshop on Sublinear Algorithms, Schloss Dagstuhl, Germany
- Dec 2006 *“Estimating Entropy (and its Friends) on Data Streams,”* Workshop on Algorithms for Data Streams, IIT Kanpur, India
- Aug 2006 *“Unsplittable Flows in Line and Ring Networks,”* 19th International Symposium on Mathematical Programming, Rio de Janeiro, Brazil
- Jun 2006 *“Estimating Entropy and Entropy Norm on Data Streams,”* Workshop on Space-Conscious Algorithms, University of Bologna Residential Center, Bertinoro, Italy

B. Other Invited Talks

- Nov 2017 *“Time-Space Tradeoffs for the Memory Game,”* Theory Seminar, Department of Computer Science, University of Massachusetts, Amherst, MA
- May 2016 *“Big Data, Communication Games, and an Inverse-Square Law,”* Computer Science colloquium, University of Warwick, UK
- Mar 2016 *“Big Data, Communication Games, and an Inverse-Square Law,”* Computer Science Colloquium, Ashoka University, Delhi
- Mar 2015 *“Verifiable Stream Computation and Arthur-Merlin Communication,”* Seminar at Simons Institute for the Theory of Computing, University of California, Berkeley, CA
- Feb 2014 *“Streaming Interactive Proofs or: How I Learned to Stop Worrying and Trust the Cloud,”* Seminar at Microsoft Research, Bangalore, India
- Feb 2014 *“A Tutorial on Information Complexity Through Its Applications,”* Algorithms & Complexity seminar, Department of Computer Science and Automation, Indian Institute of Science, Bangalore, India
- Jan 2014 *“Online and Streaming Interactive Proofs,”* Department seminar, Department of Electrical Communication Engineering, Indian Institute of Science, Bangalore, India
- Jan 2014 *“Information Complexity and the Set Intersection Problem,”* Department seminar, Advanced Computing and Microelectronics Unit, Indian Statistical Institute, Kolkata, India
- Nov 2013 *“Certifying Equality With Limited Interaction,”* Google, Mountain View, CA
- Mar 2013 *“Certifying Equality With Limited Interaction,”* Princeton Seminars in Theoretical Computer Science, Princeton, NJ
- Oct 2012 *“The Gap-Hamming-Distance Story,”* Theory Seminar, Department of Computer Science, Carnegie Mellon University, Pittsburgh, PA
- Mar 2012 *“Communication Games and Massive Data,”* Dartmouth CS prospective student visit day, Dartmouth College, Hanover, NH
- Jan 2012 *“Dubious Data Structures and Epochal Streaming Algorithms,”* Theory Seminar, Brown University, Providence, RI
- Nov 2011 *“Information Complexity: A Paradigm for Proving Lower Bounds,”* Department of Mathematics Colloquium, Dartmouth College, Hanover, NH
- Feb 2011 *“An optimal lower bound for the Gap-Hamming-Distance problem,”* AT&T Labs Research, Florham Park, NJ

- Feb 2011 *“Information Cost Tradeoffs for Augmented Index and Streaming Language Recognition”* Theoretical Computer Science and Discrete Mathematics (CSDM) Seminar, Institute for Advanced Study, Princeton, NJ
- Sep 2010 *“Information Cost Tradeoffs for Augmented Index and Streaming Language Recognition,”* Seminar at Laboratoire de Recherche en Informatique (LRI), Paris, France
- Aug 2010 *“Information Cost Tradeoffs for Augmented Index and Streaming Language Recognition,”* Department of Computer Science and Automation, Indian Institute of Science, Bangalore, India
- Aug 2010 *“An optimal lower bound for the Gap-Hamming-Distance problem,”* Seminar at Centre for Quantum Technologies, National University of Singapore, Singapore
- Jul 2010 *“Information Cost Tradeoffs for Augmented Index and Streaming Language Recognition,”* Seminar at Microsoft Research India, Bangalore, India
- Jul 2010 *“Information Complexity: A Paradigm for Proving Lower Bounds,”* Seminar at Microsoft Research India, Bangalore, India
- Jul 2010 *“Multi-pass Data Stream Lower Bounds via Round Elimination,”* Theory Seminar at Columbia University, New York, NY
- Jul 2009 *“Multi-pass Data Stream Lower Bounds via Round Elimination,”* CS Seminar at Technische Universität Dortmund, Germany
- May 2009 *“Multi-pass Data Stream Lower Bounds via Round Elimination,”* Colloquium at Microsoft Research New England, Cambridge, MA
- Oct 2008 *“Functional Monitoring Without Monotonicity,”* Microsoft Research Silicon Valley, Mountain View, CA
- Feb 2008 *“Robust Communication Complexity and Applications,”* Theory Seminar, University of Texas, Austin, TX
- Sep 2007 *“The Information Complexity Paradigm,”* Dartmouth CS Research Symposium, Dartmouth College, Hanover, NH
- Jul 2007 *“Multi-Player Pointer Jumping: Lower Bounds and Why They Matter,”* AT&T Labs Research, Florham Park, NJ
- Jun 2007 *“Multi-Player Pointer Jumping: Lower Bounds and Why They Matter,”* TOC-Talk, IBM Almaden Research Center, San Jose, CA
- Apr 2007 *“The Information Complexity Paradigm,”* Intel Research Lab, Seattle, WA
- Mar 2007 *“Lower Bounds for Multi-Player Pointer Jumping,”* Theory Seminar, Department of Computing Science, Simon Fraser University, Vancouver, Canada
- Jan 2007 *“Estimating Entropy (and its Friends) on Data Streams,”* Theory Seminar, Department of Computer Science and Engineering, University of Washington, Seattle, WA
- Nov 2006 *“Estimating Entropy (and its Friends) on Data Streams,”* Theory of Computation Seminar, School of Computer Science, McGill University, Montréal, Canada
- Oct 2006 *“Estimating Entropy (and its Friends) on Data Streams,”* Theory of Computation Seminar, IBM T. J. Watson Research Center, Yorktown Heights, NY
- May 2006 *“Estimating Entropy and Entropy Norm on Data Streams,”* Theory of Computation Seminar, Toyota Technological Institute, Chicago, IL
- Jul 2005 *“A Surprising Upper Bound for High-Dimensional Approximate Nearest Neighbour Search,”* Theory of Computation Seminar, IBM T. J. Watson Research Center, Yorktown Heights, NY
- Jun 2005 *“Lower Bounds via Information Theory and an Application to the Approximate Nearest Neighbour Search Problem,”* School of Computer Science and Software Engineering Seminar Series, Monash University, Australia
- Jun 2005 *“A Surprising Upper Bound for High-Dimensional Approximate Nearest Neighbour Search,”* Computer Science & Software Engineering Seminar, The University of Melbourne, Australia

- May 2005 “*Information Theory and Complexity*,” Faculty Presentation to Graduate Students, Department of Computer Science, Dartmouth College, Hanover, NH
- Dec 2004 “*Two Applications of Topology to Impossibility Results in Computer Science*,” Mathematics Department Colloquium, Indian Institute of Science, Bangalore, India
- Oct 2004 “*Quantum Computation: A Biased Guided Tour*,” Quantum Information Science Workshop, Department of Physics, Dartmouth College, Hanover, NH
- Aug 2004 “*Tight Bounds for Approximate Nearest Neighbour Search*,” TOC-Talk, IBM Almaden Research Center, San Jose, CA
- Mar 2004 “*Tight Bounds for Approximate Nearest Neighbour Search*,” DIMACS Theory Seminar, Rutgers University, Piscataway, NJ
- Dec 2003 “*Tight Bounds for Approximate Nearest Neighbour Search*,” U. C. Berkeley Theory Seminar, Berkeley, CA
- Nov 2003 “*Tight Bounds for Approximate Nearest Neighbour Search*,” University of Michigan Theory Seminar, Ann Arbor, MI
- Nov 2003 “*Tight Bounds for Approximate Nearest Neighbour Search*,” Princeton Seminars in Theoretical Computer Science, Princeton, NJ
- Mar 2003 “*Lower Bounds for Multi-Party Set Disjointness*,” IAS Combinatorics and Complexity Theory Seminar, Princeton, NJ
- Feb 2003 “*Informational complexity and lower bounds in communication complexity*,” CUNY Graduate Center Combinatorics Seminar, New York, NY
- Nov 2002 “*A Lower Bound for Approximate Nearest Neighbor Searching*,” IAS Combinatorics and Complexity Theory Seminar, Princeton, NJ
- Nov 2002 “*Informational Complexity and Lower Bounds in Communication Complexity*,” DIMACS, Rutgers University, Piscataway, NJ
- Apr 2002 “*Minor-closed Graph Properties are Evasive*,” CUNY Graduate Center Combinatorics Seminar, New York, NY
- Nov 2001 “*Informational Complexity and the Direct Sum Problem for Simultaneous Message Complexity*,” Institute for Advanced Study (IAS), Princeton, NJ
- Jan 2001 “*Evasiveness of Subgraph Containment and Related Properties*,” Department of Computer Science and Automation, Indian Institute of Science, Bangalore, India
- Aug 2000 “*Improved Approximation Algorithms for Bandwidth Allocation*,” AT&T Labs Research, Florham Park, NJ

Advising

A. Theses Supervised as Primary Advisor

- Sagar Kale, Ph.D., Nov 2017 *Postdoc at EPFL, Switzerland*
- Matthew Jin '17, Senior Honors thesis (earning High Honors)
- Pei Wu, M.S., Nov 2015 *Ph.D. candidate at UCLA*
- Zhenghui Wang, M.S., Jun 2013 *Employed at Google, California*
- Ranganath Kondapally, Ph.D., Dec 2012 *Employed at Microsoft, India*
- Chrisil Arackaparambil, Ph.D., Oct 2011 *Employed at Oracle, Colorado*
- Joshua Brody, Ph.D., Nov 2010 *Assistant professor (tenure-track) at Swarthmore College*
- Anna Shubina, Ph.D., Nov 2007 *Research scientist at Dartmouth College*
- Matthew Jin '17, Senior Honors thesis (earning High Honors)

- Matthew Harding '13, Senior Honors thesis (earning High Honors)
- Melissa Queen '13, Senior thesis student (earning Honors)
- Edward Talmage '12, Senior Honors thesis (earning Honors) *Ph.D. candidate at Texas A&M Univ.*
- Karn Seth '10, Senior Honors thesis (earning High Honors) *Ph.D. candidate at Cornell Univ.*
- William Henderson-Frost '08, Senior Honors thesis (earning High Honors)
- David Blinn '06, Senior Honors thesis (earning High Honors)
- Marco Adelfio '05, Senior Honors thesis (earning High Honors) *Ph.D., Univ. of Maryland*

B. Non-Thesis Undergraduate Research Supervised

- Yining Chen '18, Sophomore Science scholar
- Matthew Jin '17, Presidential scholar *Employed at Microsoft*
- Ajay Kannan '15, Presidential scholar *Employed at Baidu USA*
- Owen Worley '09, Presidential scholar *Ph.D. candidate at Northwestern Univ.*
- Khanh Do Ba '06, Dean of Faculty scholar and summer research student *Ph.D., MIT*

C. Advisory Committee Membership not as Primary Advisor

- External thesis reviewer for Ph.D. candidates Hao Song (Tsinghua University), Ved Prakash (National University of Singapore), Florent Urrutia (Université Paris Diderot)
- Member on Ph.D. thesis committee of Shahrzad Haddadan, Umang Bhaskar, Chien-Chung Huang, Sheng Zhang, David Wagner, Heng Huang, Yuhang Wang, and Zhifeng Wang
- Member on M.S. thesis committee of John J. Thomas (as co-advisor), Anne Loomis, Sahil Surana, and Fabio Drucker

D. Current Students

- Suman Kalyan Bera, Ph.D. student (fifth year)
- Prantar Ghosh, Ph.D. student (first year)
- Yining Chen '18, senior undergraduate thesis student

E. Other Advising

- Keith Carlson, Ph.D. student (advised 2012–2013)
- Anup Joshi, Ph.D. student (advised 2014–2015)

Teaching

A. Dartmouth College

- Instructor, CS39 (Theory of Computation), Spring 2018.
- Instructor, CS30 (Discrete Mathematics in Computer Science), Winter 2018.
- Instructor, CS31 (Algorithms), Spring 2017.
- Instructor, CS30 (Discrete Mathematics in Computer Science), Winter 2017.
- Instructor, CS49/149 (Lower Bounds in Computer Science), Winter 2017.
- Instructor, CS231 (Advanced Algorithms), Spring 2016.
- Instructor, CS35/135 (Data Stream Algorithms), Fall 2015.
- Instructor, CS30 (Discrete Mathematics in Computer Science), Fall 2015.
- Instructor, CS39 (Theory of Computation), Winter 2015.
- Instructor, CS30 (Discrete Mathematics in Computer Science), Fall 2014.
- Instructor, CS49/149 (Communication Protocols and Complexity), Fall 2014.
- Instructor, CS39 (Theory of Computation), Spring 2014.
- Instructor, CS31 (Algorithms), Spring 2013.
- Instructor, CS239 (Computational Complexity), Spring 2013.
- Instructor, CS39 (Theory of Computation), Winter 2013.
- Instructor, CS39 (Theory of Computation), Winter 2012.
- Instructor, CS49/149 (Data Stream Algorithms), Fall 2011.
- Instructor, CS239 (Computational Complexity), Fall 2011.
- Instructor, CS109 (Theory of Computation, Graduate Level), Spring 2011.
- Instructor, CS33 (Information Systems), Spring 2011.
- Instructor, CS106 (Numerical Linear Algebra), Fall 2010.
- Instructor, CS109 (Theory of Computation, Graduate Level), Spring 2011.
- Instructor, CS33 (Information Systems), Spring 2009.
- Instructor, CS85/185 (Data Stream Algorithms), Fall 2009.
- Instructor, CS109 (Theory of Computation, Graduate Level), Spring 2009.
- Instructor, CS33 (Information Systems), Spring 2009.
- Instructor, CS39 (Theory of Computation), Winter 2009.
- Instructor, CS85/185 (Lower Bounds in Computer Science), Spring 2008.
- Instructor, CS109 (Theory of Computation, Graduate Level), Spring 2008.
- Instructor, CS39 (Theory of Computation), Fall 2007.
- Instructor, CS39 (Theory of Computation), Fall 2006.

- Instructor, CS85/185 (Information, Communication & Complexity Theory), Winter 2006.
- Instructor, CS19 (Discrete Mathematics in Computer Science), Winter 2006.
- Instructor, CS39 (Theory of Computation), Fall 2005.
- Instructor, CS105 (Algorithms and Data Structures), Winter 2005.
- Instructor, CS39 (Theory of Computation), Winter 2005.
- Instructor, CS39 (Theory of Computation), Fall 2004.
- Instructor, CS21 (Discrete Mathematics in Computer Science), Winter 2004.
- Instructor, CS85/185 (Lower Bounds in Computer Science), Fall 2003.

B. Princeton University

- Preceptor, COS226 (Algorithms and Data Structures), Spring 2000.
- Teaching Assistant, COS423 (Theory of Algorithms), Spring 1999.
- Teaching Assistant, COS423 (Theory of Algorithms), Spring 1998.
- Teaching Assistant, COS487 (Theory of Computation), Fall 1997.
- Teaching Assistant, COS341 (Discrete Mathematics), Fall 1997.

C. IIT Bombay

- Teaching Assistant, CS101 (Computer Programming and Utilization), Fall 1995.

Professional Service

- Program Committee (TPC) member for the following conferences:
 - SODA 2019, the 30th Annual ACM-SIAM Symposium on Discrete Algorithms (upcoming)
 - ISIT 2018, the IEEE International Symposium on Information Theory
 - ESA 2017, the 25th Annual European Symposium on Algorithms
 - CCC 2017, the 32nd International Conference on Computational Complexity
 - SODA 2015, the 26th Annual ACM-SIAM Symposium on Discrete Algorithms
 - RANDOM 2013, the 17th International Workshop on Randomization and Computation
 - STOC 2013, the 45th ACM Symposium on the Theory of Computing
 - CATS 2013, the 19th edition of Computing: the Australasian Theory Symposium
 - TAMC 2011, the 8th Annual Conference on Theory and Applications of Models of Computation
 - FSTTCS 2010, the 30th IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science
 - COCOON 2010, the 16th Annual International Computing and Combinatorics Conference
 - FOCS 2009, the 50th IEEE Symposium on Foundations of Computer Science
 - CCC 2008, the 23rd IEEE Conference on Computational Complexity
- Co-Editor of *Computational Complexity*, special issue for CCC 2008.

- Organizer of the following invitation-based research workshops.
 - Weeklong workshop on “Communication Complexity and Applications,” (jointly with F. Ergun, A. McGregor, and A. Rao) at Banff International Research Station (BIRS), March 2017.
<http://www.birs.ca/events/2017/5-day-workshops/17w5147>
 - Two-week workshop on “Inference Problems,” (jointly with A. McGregor, D. P. Woodruff, H. Pfister, and D. Shah) at Institut Henri Poincaré, Paris, France. March 2016.
<http://csnexus.info/inference.html>
 - Weeklong workshop on “Communication Complexity and Applications,” (jointly with F. Ergun, A. McGregor, and A. Rao) at Banff International Research Station (BIRS), August 2014.
<http://www.birs.ca/events/2014/5-day-workshops/14w5164>
- Computer Science Honors examiner for Swarthmore College, 2016, 2017.
- Executive Committee member and Publicity Chair for ACM SIGACT, 2010–2017.
- NSF panelist and reviewer of research proposals on multiple occasions (2005–present) in the fields of Theory of Computing and Data-Intensive Computing.
- Reviewer of research proposals for W. M. Keck Foundation; U.S.–Israel Binational Science Foundation (BSF); Natural Sciences and Engineering Research Council of Canada (NSERC).
- Referee for the following journals, most on multiple occasions: *ACM Transactions on Algorithms (TALG)*, *ACM Transactions on Computation Theory (ToCT)*, *Algorithmica*, *Combinatorica*, *Computational Complexity*, *IEEE Transactions on Information Theory*, *Information Processing Letters (IPL)*, *Integration—the VLSI Journal*, *Journal of the ACM (JACM)*, *Journal of Computer and System Sciences (JCSS)*, *Journal of Parallel and Distributed Computing (JPDC)*, *Machine Learning*, *Random Structures and Algorithms*, *SIAM Journal on Computing (SICOMP)*, *Theoretical Computer Science*, *Theory of Computing*.
- Referee for the following conferences (primarily in theoretical computer science) over several years: FOCS, STOC, SODA, CCC, STACS, ICALP, RANDOM/APPROX, PODS, ISIT, ESA, SPAA, FSTTCS, COCOON, TAMC.
- Member of ACM SIGACT and MPS.

University Activities

Dartmouth College

- Committee on Admissions and Financial Aid (Summer 2017 – present)
- Committee on Standards (Summer 2012 – Spring 2014)
- Committee on Instruction (Arts & Sciences faculty) (Winter 2006)
- Early House Faculty for South House

Dartmouth College, Computer Science Department

- Founder and organizer, Dartmouth CS Theory Seminar Series (2004–07, 2008–09, 2012–13, 2017–present)
- Ph.D. Program Advisor (2017–present)
- Ph.D. Admissions Chair (2007–08, 2012–13, 2014–15)

- Ph.D. Admissions Committee (2003–04, 2004–05, 2011–12, 2016–17, 2017–18)
- Colloquium Chair (2004–05, 2005–06, Fall 2006)
- Curriculum Committee Chair (2004–05, 2005–06, 2009–10, 2014–15)
- Curriculum Committee (2003–04, 2008–09, 2010–13, 2014–15)
- Faculty Search Chair (2015–present)
- Faculty Search Committee (2011–12, 2015–present)
- Kemeny Prize Committee (2003–04)
- Library Representative (2003–04, 2007–12, 2014–present)

Princeton University, Computer Science Department

- Founder and organizer, “Let’s Talk Theory” student seminar series (1999–2000)