

Kunal Talwar

CONTACT INFORMATION

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EDUCATION

Univeristy of California, Berkeley USA

Ph.D, Computer Science, 2004.
Thesis title: *Metric Methods in Approximation Algorithms*.
Advisors: Christos H. Papadimitriou and Satish B. Rao.

Indian Institute of Technology, Delhi, India

B.Tech., Computer Science and Engineering, May 2000.

HONORS AND AWARDS

Senior Leader Bench program, Microsoft 2013-14.
Awarded the 2009 PET Award for Outstanding Research in Privacy Enhancing Technologies.
Regents Fellowship, UC Berkeley.
President's Gold Medal, IIT Delhi.
Best B.Tech Thesis award, IIT Delhi.
Gold Medal in *National Standard Examination in Physics*.
National Talent Search Scholarship.

EXPERIENCE

<i>Senior Researcher</i> , Microsoft Research SVC, Mountain View, CA.	August 2013 - present
<i>Researcher</i> , Microsoft Research SVC, Mountain View, CA.	August 2005 - August 2013
<i>Postdoctoral Researcher</i> , Microsoft Research, Redmond, WA.	August 2004-August 2005
<i>Research Intern</i> , Microsoft Research, Redmond, WA.	June-August, 2003
<i>Research Assistant</i> , UC Berkeley, CA.	2000-2004
<i>Teaching Assistant</i> , UC Berkeley, CA.	2002-2003
<i>Research Intern</i> , Google Inc., Mountain View, CA.	June-August 2001
<i>Summer Intern</i> , ValueAdd Remote Services, Delhi, India.	June-August, 2000
<i>Research Intern</i> , Basic Research in Computer Science, Aarhus, Denmark.	June-August, 1999

RESEARCH INTERESTS

Differential Privacy, Approximation Algorithms, Sketching, Data Structures, Randomized Algorithms.

PROFESSIONAL ACTIVITIES

Associate Editor, Siam Journal of Computing, 2013-present.
ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing (PODC) 2006.
Co-organized "Privacy Mindswap" at CMU Center for Computational Thinking, 2007.
ACM-SIAM Symposium on Discrete Algorithmis (SODA) 2007.
ACM Conference on Electornic Commerce (EC) 2009,2010,2011,2012.
IEEE Symposium on Foundations of Computer Science (FOCS) 2009,2011,2014.
International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX) 2011,2012.
International Colloquium on Automata, Languages and Programming (ICALP) 2013.
Poster Session Chair, Symposium on the Theory of Computing (STOC) 2013.
Chaired "Big Data and Differential Privacy" Workshop at Simons Institute, Berkeley, 2013.
Workshops Organization co-chair, STOC 2014 and FOCS 2014.

PATENTS

20 Patents applied of which 10 have been issued. List Available on request.

INTERNS MENTORED Aleksandar Nikolov (MSR Redmond, Toronto)
(AND THEIR Ravishankar Krishnaswamy (MSR Bangalore)
CURRENT Aditya Bhaskara (Google)
EMPLOYMENT) Moritz Hardt (IBM Almaden)
Anna Blasiak (Akamai)
Kamalika Chaudhuri (UCSD)
Michael Dinitz (Johns Hopkins)

- PUBLICATIONS
- [1] Umesh Shankar, Kunal Talwar, Jeffrey S. Foster and David Wagner. Detecting Format String Vulnerabilities With Type Qualifiers. In *Proceedings of the Tenth USENIX Security Symposium, August 13–17, 2001, Washington, DC, USA*, 2001.
 - [2] Kunal Talwar. The Single-Sink Buy-At-Bulk LP Has Constant Integrality Gap. In *Proceedings of the Ninth International Conference on Integer Programming and Combinatorial Optimization (IPCO)*, 2002.
 - [3] Aaron Archer, Christos Papadimitriou, Kunal Talwar and Éva Tardos. An Approximate Truthful Mechanism For Combinatorial Auctions With Single Parameter Agents. In *Proceedings of the fourteenth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 2003.
 - [4] Jittat Fakcharoenphol, Chris Harrelson, Satish Rao and Kunal Talwar. An Improved Approximation Algorithm For The 0-Extension Problem. In *Proceedings of the fourteenth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 2003.
 - [5] Kunal Talwar. The Price Of Truth: Frugality In Truthful Mechanisms. *Proceedings on the Twentieth Annual Symposium on Theoretical Aspects of Computer Science (STACS)*, 2002.
 - [6] Jittat Fakcharoenphol, Satish Rao and Kunal Talwar. A Tight Bound On Approximating Arbitrary Metrics By Tree Metrics. In *Proceedings of the Thirty-fifth Annual ACM Symposium on Theory of Computing (STOC)*, 2003.
 - [7] Jittat Fakcharoenphol and Kunal Talwar. An Improved Decomposition Theorem For Graphs Excluding A Fixed Minor. In *Proceedings of the Sixth International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX)*, 2003.
 - [8] Kamalika Chaudhuri, Brighten Godfrey, Satish Rao and Kunal Talwar. Paths, Trees And Minimum Latency Tours. In *Proceedings of the Forty-fourth Annual IEEE Symposium on Foundations of Computer Science (FOCS)*, 2003.
 - [9] Aaron Archer, Jittat Fakcharoenphol, Chris Harrelson, Robert Krauthgamer, Kunal Talwar and Éva Tardos. Approximation Classification Via Earthmover Metrics. In *Proceedings of the fifteenth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 2004.
 - [10] Alex Fabrikant, Christos Papadimitriou and Kunal Talwar. The Complexity Of Pure Nash Equilibria. In *Proceedings of the thirty-sixth annual ACM symposium on Theory of computing (STOC)*, ACM Press, New York, NY, USA, 2004.
 - [11] Kunal Talwar. Bypassing The Embedding: Algorithms For Low Dimensional Metrics. In *Proceedings of the thirty-sixth annual ACM symposium on Theory of computing (STOC)*, ACM Press, New York, NY, USA, 2004.
 - [12] Kamal Jain, Mohammad Taghi Hajiaghayi and Kunal Talwar. The Generalized Deadlock Resolution Problem. In *Proceedings of the 32nd International Colloquium Automata, Languages and Programming (ICALP)*, 2005.

- [13] Uriel Feige and Kunal Talwar. Approximating The Bandwidth Of Caterpillars. In *Proceedings of the 8th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX)*, 2005.
- [14] Kamalika Chaudhuri, Satish Rao, Samantha Riesenfeld and Kunal Talwar. What Would Edmonds Do? Augmenting Paths And Witnesses For Degree-Bounded MSTs. In *Proceedings of the 8th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX)*, 2005.
- [15] Shuchi Chawla Cynthia Dwork Frank McSherry and Kunal Talwar. On Privacy-Preserving Histograms. In *Proceedings of the 21st Conference on Uncertainty in Artificial Intelligence (UAI)*, 2005.
- [16] Nicole Immorlica, Kamal Jain, Mohammad Mahdian and Kunal Talwar. Click Fraud Resistant Methods For Learning Click-Through Rates. In *Internet and Network Economics, First International Workshop, (WINE)*, 2005.
- [17] Dinesh Garg, Kamal Jain, Kunal Talwar and Vijay V. Vazirani. A Primal-Dual Algorithm For Computing Fisher Equilibrium In The Absence Of Gross Substitutability Property. In *Internet and Network Economics, First International Workshop, (WINE)*, 2005.
- [18] Kamal Jain, Aranyak Mehta, Kunal Talwar and Vijay V. Vazirani. A Simple Characterization For Truth-Revealing Single-Item Auctions. In *Internet and Network Economics, First International Workshop, (WINE)*, 2005.
- [19] Anupam Gupta and Kunal Talwar. Approximating Unique Games. In *Proceedings of the Seventeenth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 2006.
- [20] Kamalika Chaudhuri, Satish Rao, Samantha Riesenfeld and Kunal Talwar. A Push-Relabel Algorithm For Approximating Degree Bounded MSTs. In *Proceedings of the 33rd International Colloquium Automata, Languages and Programming (ICALP)*, 2006.
- [21] Julia Chuzhoy, Venkatesan Guruswami, Sanjeev Khanna and Kunal Talwar. Hardness Of Routing With Congestion In Directed Graphs. In *Proceedings on the 39th ACM Symposium on Theory of Computing (STOC)*, 2007.
- [22] Cynthia Dwork, Frank McSherry and Kunal Talwar. The Price Of Privacy And The Limits Of LP Decoding. In *Proceedings on the 39th ACM Symposium on Theory of Computing (STOC)*, 2007.
- [23] Kunal Talwar and Udi Wieder. Balanced Allocations: The Weighted Case. In *Proceedings on the 39th ACM Symposium on Theory of Computing (STOC)*, 2007.
- [24] Boaz Barak, Kamalika Chaudhuri, Cynthia Dwork, Satyen Kale, Frank McSherry and Kunal Talwar. Privacy, Accuracy, And Consistency Too: A Holistic Solution To Contingency Table Release. In *26th ACM SIGMOD-SIGACT-SIGART Symposium on Principles of Database Systems (PODS)*, 2007.
- [25] Ittai Abraham, Mahesh Balakrishnan, Fabian Kuhn, Dahlia Malkhi, Venugopalan Ramasubramanian, and Kunal Talwar. Reconstructing approximate tree metrics. In *Proceedings of Twenty-Sixth Annual ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing (PODC)*, 2007.
- [26] Frank McSherry and Kunal Talwar. Mechanism design via differential privacy. In *Proceedings of the Forty-eighth Annual IEEE Symposium on Foundations of Computer Science (FOCS)*, 2007.
- [27] Nicole Immorlica, Anna Karlin, Mohammad Mahdian, and Kunal Talwar. Balloon popping with applications to ascending auctions. In *Proceedings of the Forty-eighth Annual IEEE Symposium*

on *Foundations of Computer Science (FOCS)*, 2007.

[28] Jittat Fakcharoenphol, Satish Rao, and Kunal Talwar. Approximating metric spaces by tree metrics. In *Encyclopedia of Algorithms*. Springer, 2008.

[29] T.-H. Hubert Chan, Anupam Gupta, and Kunal Talwar. Ultra-low-dimensional embeddings for doubling metrics. In *Proceedings of the Nineteenth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pages 333–342. SIAM, 2008.

[30] Maleq Khan, Fabian Kuhn, Dahlia Malkhi, Gopal Pandurangan, and Kunal Talwar. Efficient distributed approximation algorithms via probabilistic tree embeddings. In *Proceedings of the Twenty-Seventh Annual ACM Symposium on Principles of Distributed Computing (PODC)*, pages 263–272. ACM, 2008.

[31] Anupam Gupta and Kunal Talwar. How to complete a doubling metric. In *LATIN 2008: Theoretical Informatics, 8th Latin American Symposium*, volume 4957 of *Lecture Notes in Computer Science*, pages 36–47. Springer, 2008.

[32] David B. Shmoys and Kunal Talwar. A constant approximation algorithm for the *a priori* traveling salesman problem. In *Integer Programming and Combinatorial Optimization, 13th International Conference (IPCO)*, volume 5035 of *Lecture Notes in Computer Science*, pages 331–343. Springer, 2008.

[33] Rina Panigrahy, Kunal Talwar, and Udi Wieder. A geometric approach to lower bounds for approximate near-neighbor search and partial match. In *49th Annual IEEE Symposium on Foundations of Computer Science (FOCS)*, pages 414–423. IEEE Computer Society, 2008.

[34] Moshe Babaioff, Michael Dinitz, Anupam Gupta, Nicole Immorlica, and Kunal Talwar. Secretary problems: weights and discounts. In *Proceedings of the Twentieth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pages 1245–1254. SIAM, 2009.

[35] Michael Isard, Vijayan Prabhakaran, Jon Currey, Udi Wieder, Kunal Talwar, and Andrew Goldberg. Quincy: fair scheduling for distributed computing clusters. In *SOSP*, pages 261–276, 2009.

[36] Anupam Gupta, Aaron Roth, Grant Schoenebeck, and Kunal Talwar. Constrained non-monotone submodular maximization: Offline and secretary algorithms. In *WINE*, pages 246–257, 2010.

[37] Moritz Hardt and Kunal Talwar. On the geometry of differential privacy. In *STOC*, pages 705–714, 2010.

[38] Yuval Peres, Kunal Talwar, and Udi Wieder. The $(1 + \beta)$ -choice process and weighted balls-into-bins. In *SODA*, pages 1613–1619, 2010.

[39] Anupam Gupta, Katrina Ligett, Frank McSherry, Aaron Roth, and Kunal Talwar. Differentially private combinatorial optimization. In *SODA*, pages 1106–1125, 2010.

[40] Andrej Bogdanov, Kunal Talwar, and Andrew Wan. Hard instances for satisfiability and quasi-one-way functions. In *ICS*, pages 290–300, 2010.

[41] Rina Panigrahy, Kunal Talwar, and Udi Wieder. Lower bounds on near neighbor search via metric expansion. In *FOCS*, pages 805–814, 2010.

[42] Andrew McGregor, Ilya Mironov, Toniann Pitassi, Omer Reingold, Kunal Talwar, and Salil P. Vadhan. The limits of two-party differential privacy. In *FOCS*, pages 81–90, 2010.

- [43]Mohit Singh and Kunal Talwar. Improving integrality gaps via chvátal-gomory rounding. In *APPROX-RANDOM*, pages 366–379, 2010.
- [44]Matthias Englert, Anupam Gupta, Robert Krauthgamer, Harald Räcke, Inbal Talgam-Cohen, and Kunal Talwar. Vertex sparsifiers: New results from old techniques. In *APPROX-RANDOM*, pages 152–165, 2010.
- [45]Matthew Andrews, Julia Chuzhoy, Venkatesan Guruswami, Sanjeev Khanna, Kunal Talwar, and Lisa Zhang. Inapproximability of edge-disjoint paths and low congestion routing on undirected graphs. *Combinatorica*, 30(5):485–520, 2010.
- [46]Aditya Bhaskara, Daniel Dadush, Ravishankar Krishnaswamy, and Kunal Talwar. Unconditional differentially private mechanisms for linear queries. In *STOC*, pages 1269–1284, 2012.
- [47]Michael Kapralov and Kunal Talwar. On differentially private low rank approximation. In *SODA*, pages 1395–1414, 2013.
- [48]Aditya Bhaskara, Ravishankar Krishnaswamy, Kunal Talwar, and Udi Wieder. Minimum makespan scheduling with low rank processing times. In *SODA*, pages 937–947, 2013.
- [49]Aleksandar Nikolov, Kunal Talwar, and Li Zhang. The geometry of differential privacy: the sparse and approximate cases. In *STOC*, pages 351–360, 2013.
- [50]Anupam Gupta, Kunal Talwar, and David Witmer. Sparsest cut on bounded treewidth graphs: algorithms and hardness results. In *STOC*, pages 281–290, 2013.
- [51]Robert Krauthgamer, Joseph Naor, Roy Schwartz, and Kunal Talwar. Non-uniform graph partitioning. In *SODA*, pages 1229–1243, 2014.
- [52]Cynthia Dwork, Aleksandar Nikolov, and Kunal Talwar. Using convex relaxations for efficiently and privately releasing marginals. In *SoCG*, page 261, 2014.
- [53]Kunal Talwar and Udi Wieder. Balanced allocations: A simple proof for the heavily loaded case. In *ICALP*, pages 979–990, 2014.
- [54]Anupam Gupta, Kunal Talwar, and Udi Wieder. Changing bases: Multistage optimization for matroids and matchings. In *ICALP*, pages 563–575, 2014.
- [55]Ittai Abraham, Cyril Gavoille, Anupam Gupta, Ofer Neiman, and Kunal Talwar. Cops, robbers, and threatening skeletons: padded decomposition for minor-free graphs. In *STOC*, pages 79–88, 2014.
- [56]Cynthia Dwork, Kunal Talwar, Abhradeep Thakurta, and Li Zhang. Analyze Gauss: optimal bounds for privacy-preserving principal component analysis. In *STOC*, pages 11–20, 2014.
- [57]Ittai Abraham, Shiri Chechik, and Kunal Talwar. Fully dynamic all-pairs shortest paths: Breaking the $O(n)$ barrier. In *APPROX*, pages 1–16, 2014.
- [58]Aleksandar Nikolov and Kunal Talwar. Approximating hereditary discrepancy via small width ellipsoids. In *SODA*, 2015. To Appear.