

Sushant Sachdeva

Postdoctoral Associate, Yale University

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INFORMATION <https://sites.google.com/site/sachdevasushant/>

RESEARCH **Algorithms, and its connections to learning, optimization, and statistics**

INTERESTS My recent research has focused on the design of fast algorithms, using techniques from convex optimization, numerical linear algebra, and approximation theory.

APPOINTMENTS **Google** Mountain View, CA

Research Scientist Aug 2016 – Present

Yale University New Haven, CT

Postdoctoral Associate, Department of Computer Science Jan 2014 – July 2016

Supervisor: Prof. Daniel Spielman

Lecturer, Department of Computer Science Jan 2015 – May 2015

UC Berkeley, Simons Institute for the Theory of Computing Berkeley, CA

Simons Research Fellow Aug 2013 – Dec 2013

Program: Real Analysis in Computer Science

EDUCATION **Princeton University** Princeton, NJ

Ph.D., *Department of Computer Science* Sep 2008 - Sep 2013

Thesis: New Results in the Theory of Approximation — Fast Graph Algorithms and Inapproximability

Adviser: Prof. Sanjeev Arora

Area of study: Theoretical Computer Science

M.A., *Department of Computer Science* Sep 2008 – Jun 2010

GPA: 4.0/4.0

Indian Institute of Technology Bombay Mumbai, India

B.Tech., *Department of Computer Science and Engineering* Jul 2004 – Aug 2008

Adviser: Sundar Vishwanathan

CPI: 9.97/10.00

HONORS AND AWARDS Awarded **President of India Gold Medal** for topping the class of 2008 (of 500+ students)

Ranked **1st all over India** in IIT Entrance Examination 2004 (among 170,000+ students)

Bronze Medalist at 36th International Chemistry Olympiad (IChO) 2004, Kiel, Germany

Represented IIT Bombay at **ACM ICPC World Finals, Tokyo 2007**

Scored a perfect SPI of 10.0 in 7 semesters out of 8 at IIT Bombay

Awarded a grade of AP for outstanding performance in ten courses at IIT Bombay

Awarded Jayanti Deshmukh Memorial Gold Medal for being the most outstanding B.Tech. student in the computer science class of 2008 (out of 35 students)

Awarded Aditya Birla Scholarship 2004–08, covering my undergraduate studies. It is awarded to only 10 engineering students each year.

Awarded Dhirubai Ambani Scholarship 2004–08 for being among the top 10 students of Maharashtra state in AISSCE 2004.

Awarded Kishore Vaigyanik Protsahan Yojana (KVPY) fellowship 2002–04. Awarded to

around 50 students each year; aimed at promoting research careers in the sciences.

- MONOGRAPHS *Faster Algorithms via Approximation Theory*
S. Sachdeva, N. K. Vishnoi
In Foundations and Trends in Theoretical Computer Science 9.2 (FTTCS) 2014, pp. 125-210
- REFEREED JOURNAL PUBLICATIONS *An Arithmetic Analogue of Fox's Triangle Removal Argument*
P. Hatami, S. Sachdeva, M. Tulsiani
In Online Journal of Analytic Combinatorics 11 (OJAC) 2016
- Provable ICA with Unknown Gaussian Noise, and Implications for Gaussian Mixtures and Autoencoders*
S. Arora, R. Ge, A. Moitra, S. Sachdeva
In Algorithmica 72.1 (May 2015), pp. 215–236
- Inapproximability of Minimum Vertex Cover on k -Uniform k -Partite Hypergraphs*
V. Guruswami, S. Sachdeva, R. Saket
In SIAM Journal on Discrete Mathematics 29.1 (SIDMA) 2015, pp. 36–58
- REFEREED CONFERENCE / WORKSHOP PUBLICATIONS *Sparsified Cholesky and Multigrid Solvers for Connection Laplacians*
R. Kyng, Y. T. Lee, R. Peng, S. Sachdeva, and D. A. Spielman
To appear at 48th ACM Symposium on Theory of Computing (STOC) 2016
- Fast, Provable Algorithms for Isotonic Regression in all ℓ_p -norms*
R. Kyng, A. Rao, S. Sachdeva
In 29th Advances in Neural Information Processing Systems (NIPS) 2015
- Algorithms for Lipschitz Learning on Graphs*
R. Kyng, A. Rao, S. Sachdeva, D. A. Spielman
In 28th Conference on Learning Theory (COLT) 2015
- Simultaneous Approximation of Constraint Satisfaction Problems*
A. Bhangale, S. Kopparty, S. Sachdeva
In 42nd International Colloquium on Automata, Languages, and Programming (ICALP) 2015
- Optimal Inapproximability for Scheduling Problems via Structural Hardness for Hypergraph Vertex Cover*
S. Sachdeva, R. Saket
In 28th IEEE Conference on Computational Complexity (CCC) 2013
- Approximating the Exponential, the Lanczos Method and an $\tilde{O}(m)$ -Time Spectral Algorithm for Balanced Separator*
L. Orecchia, S. Sachdeva, N. K. Vishnoi
In 44th ACM Symposium on Theory of Computing (STOC) 2012
- Provable ICA with Unknown Gaussian Noise, and Implications for Gaussian Mixtures and Autoencoders*
S. Arora, R. Ge, A. Moitra, S. Sachdeva
In 26th Advances in Neural Information Processing Systems (NIPS) 2012
- Finding Overlapping Communities in Social Networks: Towards a Rigorous Approach*
S. Arora, R. Ge, S. Sachdeva, G. Schoenebeck
In 13th ACM Conference on Electronic Commerce (EC) 2012
- Testing Permanent Oracles — Revisited*
S. Arora, A. Bhattacharyya, R. Manokaran, S. Sachdeva
In 16th International Workshop on Randomization and Computation (RANDOM) 2012

Nearly Optimal NP-Hardness of Vertex Cover on k -Uniform k -Partite Hypergraphs

S. Sachdeva, R. Saket

In 14th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX) 2011

SELECT

A Simple Analysis of the Dikin Walk

MANUSCRIPTS

S. Sachdeva, N. Vishnoi

Cuts in Cartesian Products of Graphs

S. Sachdeva, M. Tulsiani

THESES

New Results in the Theory of Approximation: Fast Graph Algorithms and Inapproximability

Ph.D. Thesis, Princeton University, 2013. Advised by Sanjeev Arora

On the Hardness of Approximating Vertex Cover

B.Tech. Thesis, IIT Bombay, 2008. Advised by Sundar Vishwanathan

OTHER

PUBLICATIONS

Greedy Geometric Algorithms for Collection of Balls, with Applications to Geometric Approximation and Molecular Coarse-Graining

F. Cazals, T. Dreyfus, S. Sachdeva, N. Shah

In Computer Graphics Forum 33–6, 2014

On the Characterization and Selection of Diverse Conformational Ensembles with Applications to Flexible Docking

S. Lorient, S. Sachdeva, K. Bastard, C. Prevost, F. Cazals

In Computational Biology and Bioinformatics, IEEE/ACM Transactions on 8.2 (TCBB) 2011, pp. 487–498

TALKS

Regression on Graphs – Lipschitz and Isotonic

University of Chicago, Scientific and statistical computing seminar, Nov 2015

Lipschitz Learning on Graphs

IIT Bombay, CS department seminar, Jul 2015

EPFL (École Polytechnique Fédérale de Lausanne) INF department seminar, Jul 2015

Conference on Learning Theory (COLT), Paris, Jul 2015

UC San Diego, CS department theory seminar, May 2015

Yale University, Statistics department seminar, Apr 2015

Triangle Removal in Groups

Simons Institute, UC Berkeley, Real analysis seminar, Nov 2013

Institute for Advanced Study (IAS) Computer science/discrete mathematics seminar, Apr 2013

Generalizations of KKL Theorem and Friedgut's Junta Theorem

Simons Institute, UC Berkeley, Real analysis workshop, Aug 2013

Hardness for Scheduling Problems

Conference on Computational Complexity (CCC), Palo Alto, Jun 2013

Near-linear Time Algorithms for Balanced Separator

Rutgers University, DIMACS/CS theoretical computer science seminar, Mar 2013

University of Washington, ETP theory connections, Aug 2012

Symposium on Theory of Computing (STOC), New York, May 2012

Institute for Advanced Study (IAS) Computer science/discrete mathematics seminar, Apr 2012

Testing Permanent Oracles

International Workshop on Randomization and Computation (RANDOM), Boston, Aug 2012

PROFESSIONAL

SERVICE

Reviewer: SODA 2016, STOC 2015, SODA 2015, SIDMA, QIC, Random 2014, FOCS 2014, STOC 2014, FSTTCS 2013, SODA 2014, Approx 2013, TOC, Algorithmica, ITCS 2013, SODA 2013, ICALP 2012, LATIN 2012, SODA 2012, FSTTCS 2011

TEACHING EXPERIENCE	Lecturer, Yale University	
	<i>Lecturer for CPSC 665 : An Algorithmist's toolkit</i>	Spring 2015
	Designed and taught a full course on advanced algorithms (2 lectures a week)	
	55% of students rated the course excellent (highest rating)	
	Teaching Assistant, Princeton University	
PROFESSIONAL EXPERIENCE	<i>Assistant in Instruction for COS 433: Cryptography</i>	Spring 2010
	Taught weekly precepts, organized weekly question hours, graded assignments and exams	
	<i>Assistant in Instruction for COS 340: Reasoning About Computation</i>	Fall 2009
	Taught weekly precepts, organized weekly question hours, graded assignments and exams	
	Taught one 1.5-hr lecture	
	Toyota Technological Institute	Chicago, IL
	<i>Research Intern, Summer 2012</i>	
	Supervisor: Yury Makarychev	
	Lower bounds for Vertex Sparsifiers.	
	Microsoft Research India	Bangalore, India
REFERENCES	<i>Research Intern, Summer 2011</i>	
	Supervisor: Nisheeth K. Vishnoi	
	Fast algorithms for Balanced Separator.	
	INRIA	Sophia-Antipolis, France
	<i>Research Intern, Summer 2007</i>	
	Supervisor: Frederic Cazals (Research Director, Geometrica group).	
	Selecting a representative set of protein conformers.	
	ETH	Zurich, Switzerland
	<i>Research Intern, Summer 2006</i>	
	Supervisor: Riko Jacob (Algorithms, Data Structures, and Applications group).	
	Cache efficiency of shortest path algorithms with preprocessing.	
	Prof. Daniel Spielman (spielman@cs.yale.edu)	
	Henry Ford II Professor of Computer Science, Mathematics, and Applied Mathematics	
	Yale University	
	Prof. Sanjeev Arora (arora@cs.princeton.edu)	
	Charles C. Fitzmorris Professor of Computer Science	
	Princeton University	
	(Please contact admin. assistant Mitra Kelly at mkelly@cs.princeton.edu)	
	Prof. Nisheeth K. Vishnoi (nisheeth.vishnoi@epfl.ch)	
	Associate Professor of Computer Science	
	EPFL (École Polytechnique Fédérale de Lausanne)	
	Prof. John Lafferty (lafferty@galton.uchicago.edu)	
	Louis Block Professor at Departments of Statistics, Computer Science, and the College	
	University of Chicago	
	Prof. Jonathan Kelner (kelner@mit.edu)	
	Mark Hyman, Jr. Career Development Associate Professor of Applied Mathematics	
	MIT (Massachusetts Institute of Technology)	