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Areas of Interest

Complexity Theory, Approximation and Inapproximability.

Education

- **University of California, Berkeley**
  Ph.D. in Computer Science (2005-present)
  Advisor: Luca Trevisan
  GPA: 4.0/4.0 (seven semesters)

- **Indian Institute of Technology, Kanpur, India**
  B.Tech in Computer Science and Engineering (2001-2005)
  GPA: 10.0/10.0

Employment

- **Summer Intern:** Microsoft Research Bangalore (India), Summer 2008
- **Author of solution manual** for the textbook *Algorithms* by Dasgupta, Papadimitriou and Vazirani (along with Alexandra Kolla and Lorenzo Orecchia)
- **Teaching Assistant:** CS172 - Computability & Complexity, UC Berkeley, Spring 2007.
- **Teaching Assistant:** CS170 - Algorithms & Intractable Problems, UC Berkeley, Fall 2006.
- **Summer Intern:** INRIA Rocquencourt, Le Chesnay (France), Summer 2004.

Awards

- Outstanding GSI (Graduate Student Instructor) Award, UC Berkeley, Fall 2006
- UC Berkeley Regents fellowship (2005-06)
- President's Gold Medal for best academic performance among all departments in graduating class of 2005 at IIT Kanpur
- Director's Gold Medal for best all-round achievement and leadership in graduating class of 2005 at IIT Kanpur
- Academic Excellence Awards from IIT Kanpur for the years 2001-02, 2002-03 and 2003-04
- All India Rank 2 in IIT Joint Entrance Examination, 2001

Refereeing

STOC, STACS, CCC, Theory of Computing, SIAM Journal on Computing.

Publications

1. **A Linear Round Lower Bound for Lovasz-Schrijver SDP Relaxations of Vertex Cover**
(with Grant Schoenebeck and Luca Trevisan)
In *Proc. of 22nd Computational Complexity Conference*, IEEE, 2007

   We prove that the integrality gap for Vertex Cover remains at least $7/6 - \epsilon$ after $\Omega_\epsilon(n)$ rounds of LS_+ method, which generates tighter semidefinite relaxations at each round.

2. **Tight Integrality Gaps for Lovasz-Schrijver LP Relaxations of Vertex Cover and Max Cut**
(with Grant Schoenebeck and Luca Trevisan), In *Proc. of 39th STOC*, ACM, 2007

   We prove optimal integrality gaps of $2 - \epsilon$ and $1/2 + \epsilon$ for the linear programming relaxations of Vertex Cover and Max Cut respectively, arising from $\Omega_\epsilon(n)$ rounds of "lift-and-project" method of Lovasz and Schrijver.

3. **Unique Games on Expanding Constraint Graphs are Easy**
(with Sanjeev Arora, Subhash Khot, Alexandra Kolla, David Steurer and Nisheeth Vishnoi)
In *Proc. of 40th STOC*, ACM, 2008

   We present an efficient SDP-based algorithm to for solving the Unique Games problem when the underlying constraint graph is an expander. This also gives a parallel repetition theorem for Unique Games on expanding constraint graphs.

4. **Dense Subsets of Pseudorandom Sets**
(with Omer Reingold, Luca Trevisan and Salil Vadhan), In *Proc. of 49th FOCS*, IEEE, 2008

   We provide a new proof of a theorem of Green, Tao and Ziegler stating that dense subsets of pseudorandom objects are indistinguishable from dense subsets of random sets, for very general notions of distinguishers and pseudorandomness. We also adapt their techniques to give a proof of Imapgliazzo's hard-core lemma with certain new consequences.

5. **Boosting, Regularity, and Efficiently Simulating Every High-Entropy Distribution**
(with Luca Trevisan and Salil Vadhan), *Submitted*
We explore the connections between the weak regularity lemma of Frieze-Kannan, the hard-core lemma of Impagliazzo and the Dense Model Theorem of Green, Tao and Ziegler. We show that all proof techniques used for proving these seemingly different results can be used to prove a common generalization.

6. **CSP Gaps and Reductions in the Lasserre Hierarchy**
In *Proc. of 41st STOC*, ACM, 2009 (*To appear)*

   We establish optimal integrality gaps for constraint satisfaction problems in the hierarchy of SDPs defined by Lasserre. We also show that reductions can be used to convert these to strong integrality gaps for Independent Set, Chromatic Number, Approximate Graph Coloring and Vertex Cover.

7. **Optimal Sherali-Adams Gaps from Pairwise Independence**
(with Avner Magen and Konstantinos Georgiou), *Submitted*
We show integrality gaps for constraint satisfaction problems in the Sherali-Adams hierarchy of LPs, under the most general condition for which hardness results are known. Specifically, we show that if the set of satisfying assignments to each constraint contains a pairwise independent distribution, then the integrality gap remains maximum possible.

References

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