Rishi Gupta

Massachusetts Institute of Technology
rishig@mit.edu (650) 930-6997

RESEARCH EXPERIENCE

Compressive Sensing
Supervised by Piotr Indyk at MIT and Yaron Rachlin at Draper Labs *Summer 2010 –*
Designed a new framework for compressive sensing that can incorporate certain types of prior information about the biggest coefficients in the signal. The framework is inspired by a problem in satellite navigation, and (in simulation) recovers compressed satellite imagery orders of magnitude faster than existing algorithms [1].
Assisted a co-author in incorporating a different set of prior information into a compressive sensing algorithm that gives guarantees under earth mover distance [2].

Dynamic optimality in Binary Search Trees
Supervised by Erik Demaine at MIT *Spring 2010 –*
Ongoing work to show that there exists an on-line binary search tree algorithm that is only a constant factor slower than the best possible off-line binary search tree algorithm.

The consistency of P=NP with fragments of Number Theory
Supervised by Vijay Ganesh at MIT *Spring 2009*
Wrote an expository paper in logic and complexity theory, inspired by "The consistency of P=NP and related problems with fragments of number theory" by DeMillo and Lipton.

Computing the Zeta function of Hyperelliptic Curves
Supervised by Ruochuan Liu, under Kiran Kedlaya at MIT *Summer 2008*
Worked on a project to generalize a set of python packages that compute the Zeta function of elliptic curves, and wrote an expository paper in algebraic geometry.

Reduced Decompositions of 321-Avoiding Permutations
Supervised by Lauren Williams at Harvard *Fall 2007*
Independently classified the reduced decompositions of 321-avoiding permutations, which was a previously known result.
Available at `http://web.mit.edu/rishig/papers/reduced-decom.pdf`

Self-Organizing Systems
Supervised by Radhika Nagpal at Harvard *Summer 2007*
Programmed NXT Mindstorms microcontrollers in C and assembly to work with new sensors, such as RFID and Bluetooth.

PUBLICATIONS

1. R. Gupta, P. Indyk, E. Price, Y. Rachlin. *Compressive Sensing with Local Geometric Features.* Submitted to the Symposium on Computational Geometry (June 2011).
   Available at `http://web.mit.edu/rishig/papers/local-geometry.pdf`

2. R. Gupta, P. Indyk, E. Price. *Sparse Recovery for Earth Mover Distance.* Invited paper, Allerton Conference on Communication, Control, and Computing (October 2010).
   Available at `http://web.mit.edu/rishig/papers/earth-mover.pdf`

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA *2008 –*
M.Eng in Computer Science expected June 2011. Advised by Piotr Indyk.
B.S. in Math and Computer Science to be received June 2011. GPA 4.8/5 overall, 4.8/5 in major.
Graduate Courses: Sublinear Algorithms (Fall 2010), Data Structures, Operating System Engineering, Complexity Theory, Natural Language Processing, Combinatorics and Geometry.

Harvard University, Cambridge, MA *2005 – 2007*
Transferred to MIT after Fall 2007. Completed most of a degree in Theoretical Math.
GPA 3.6/4 overall, 3.8/4 in major. Graduate Courses: Efficient Algorithms.

Math Olympiad Summer Program, Lincoln, NE *Summers 2002-2005*

Henry M. Gunn High School, Palo Alto, CA *2001-2005*

LEADERSHIP

Harvard-MIT Math Tournament
Tournament Director and Problem Writer *2006-2010*
As tournament director, I co-organized an existing full day math contest for 700 high schoolers. I also started several additional math competitions during this time:
– A contest for 300 high schoolers in the greater Boston area, now in its fourth year.
– A contest for Harvard and MIT students, based around the undergraduate curriculum in theoretical math, now in its second year.
– A small recruitment contest for entering freshmen at Harvard.

East Campus "Bad Ideas" Engineering Competition
Lead organizer *Jan 2009*
A weekend of unusual and innovative mechanical and electronic projects. As lead organizer I raised $7000 and helped guide over two dozen projects and events.

Residential hall, East Campus, MIT
Hall chair *Sep 2008 - Dec 2009*
Helped my hall of 40 students spend its budget on projects and activities in an impactful way.

Harvard Atomic Runners' Collective
Co-founder *Nov 2006 - Dec 2007*
Re-started an adventure running club that ran races around the Boston area.

Gunn Cross-Country
Co-captain of 70 person cross-country team. *Fall 2004*

Gunn Robotics Team
Head of 10 person subgroup. *Jan-Mar 2004*

AWARDS AND GRANTS

Research Fellowships and Programs

Draper Labs Fellowship (for Masters research)	*2010-2011*
Undergraduate Research Opportunities Program, MIT	*Spring 2010*
Summer Program in Undergraduate Mathematics, MIT Math Dept.	*Summer 2008*
Program for Research in Science and Engineering, Harvard	*Summer 2007*
Harvard College Research Program	*Summer 2007*

Competitions

William Lowell Putnam Math Competition, Honorable Mention	*2006-07, 2009*
USA Math Olympiad, Winner (top 12)	*2005*
Mathcounts Nationals, Fourth place	*2001*

OTHER EXPERIENCE

Teaching

- Java Instructor, Middle-East Education through Technology, Jerusalem — *Summer 2009*
- Tutor for Data Structures and Algorithms, Harvard — *Feb-May 2007*

Referee

- For IEEE Transactions on Signal Processing — *Nov 2010*

Poster

- *Sparse Recovery for Earth Mover Distance*, Center for Massive Data Algorithmics (cf. Publication 2) — *Jan 2011*

Work Experience and Internships

- Intern at Arcot Systems. Made web demos in Javascript and JSP. — *Summer 2006*
- Grader and occasional (on-line) teacher for Art of Problem Solving. — *Spring 2006*
- Intern at the Palo Alto Research Center. — *August 2004*

Public Service

- Co-built a "smokeless" stove for poor urban households in Gujarat, India. — *Spring 2008*