

Pritish Kamath

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Brief Bio

Pritish is currently pursuing a PhD. in Computer Science at MIT. His research primarily focusses on various theoretical aspects of computer science, in particular, on understanding the computational hardness that arises in problems across different domains such as algebraic computations, communication problems and learning theory.

Previously, he finished undergrad (B.Tech.) in Computer Science & Engg. at IIT Bombay, where he was awarded the *President of India Gold Medal* for the best academic performance in the graduating batch. He has later worked for a year at Microsoft Research India as a Research Fellow before joining MIT.

Education

- 2013- **PhD.** (ongoing) in **Electrical Engineering & Computer Sciences**
Massachusetts Institute of Technology
Advisors: Madhu Sudan (Harvard) & Ronitt Rubinfeld (MIT)
- 2015 **S.M.** in **Electrical Engineering & Computer Sciences**
Massachusetts Institute of Technology
Advisor: Madhu Sudan (Microsoft Research New England, MIT)
S.M. Thesis: Communication complexity of permutation-invariant functions
- 2012 **B.Tech.** in **Computer Science and Engineering**
Indian Institute of Technology, Bombay
Advisor: Supratik Chakraborty
B.Tech. Thesis: Studies on Preservation Theorems and Weaker Ehrenfeucht-Fraïssé games
CGPA (core): = 9.70/10.0; *CGPA (overall)* = 9.77/10.0

Awards and Honors

- 2013-14 **Akamai Presidential Fellowship**, MIT
- 2013 **Best Paper Award** (*co-winner*), Conference on Computational Complexity (CCC)
- 2012 **President of India Gold Medal** for best academic performance in the graduating batch across all disciplines of B.Tech programme at IIT Bombay
- 2012 **Institute Silver Medal** for best academic performance in the graduating batch of B.Tech programme in the Computer Science and Engineering Dept, IIT Bombay
- 2012 **Minor in Mathematics** with GPA of 10.0/10.0
- 2008 **All India Rank of 21** in IIT Joint Entrance Examination (among 375,000 students)
- 2008 **Gold Medal and Certificate of Merit** in *Indian National Physics Olympiad* for being ranked among the top 35 students in the country
- 2008 **Certificate of Merit** in *Indian National Mathematics Olympiad 2008* (ranked among the top 30); attended the International Mathematics Olympiad Training Camp 2008

Other Experience

- ▷ **Research Fellow, Microsoft Research India, Bangalore, India** Neeraj Kayal
Lower Bounds in Arithmetic Complexity Theory [Jun. 2012 - July 2013]
- ▷ **Research Intern, IST, Austria** Krishnendu Chatterjee
Efficient algorithms for computing simulation relations between systems [May - July 2011]
- ▷ **Research Intern, INRIA, Rennes-Bretagne, France** Rumen Andonov
Protein Classification via Maximum Cliques on Alignment graphs [May - July 2010]

Course Projects

- Fall 2016 **Theoretical limits of Deep Learning**
MIT as part of 9.520 *Statistical Learning Theory & Applications* at MIT
Gave a unified framework for understanding classes of functions which are efficiently computable by large depth NNs, but cannot be approximated by small depth NNs unless they are of substantially larger size. This work was built on two papers from COLT 2016: “Benefits of depth in Neural Networks” (by Matus Telgarsky) and “The Power of Depth for Feedforward Neural Networks” (by Ronen Eldan & Ohad Shamir). This establishes examples of functions where larger depth of NNs are helpful.
- Spring 2014 **TnT: A file system synchronizer**
MIT as part of 6.824 *Distributed Systems* at MIT
Programming Language: Go
Built a performant and crash-resilient peer-to-peer file-system synchronizer in Go. TnT ensures all the desirable properties of a file-system synchronizer namely, no restriction on synchronization patterns, no false conflicts, no metadata for deleted files, network usage proportional to changed files and partial synchronizations within the file tree. A novel feature of our system was a two-phase synchronization method to ensure that crashes do not effect the system adversely even if they happen during sync.
- Spring 2009 **Chess AI**
IIT Bombay as part of CS 152 *Abstractions & Paradigms in CS* at IIT Bombay
Programming Language: Scheme
Developed a chess engine in Scheme using min-max algorithm. Used alpha-beta pruning to increase the efficiency of our engine. Experimented with different heuristics and the chess engine was found to solve several “tricky” end-game situations.

Publications

Note: Authors are in alphabetical order of last name unless marked with (*)

Journal Papers

- J. ACM 2014 *Approaching the chasm at depth four*
Ankit Gupta, Pritish Kamath, Neeraj Kayal, Ramprasad Saptharishi
- CACM 2017 *Arithmetic circuits: A chasm at depth three*
Ankit Gupta, Pritish Kamath, Neeraj Kayal, Ramprasad Saptharishi
(also appeared in *SIAM J. Computing* 2016)

Conference Papers / Manuscripts

- Manuscript *Monotone Circuit Lower Bounds from Resolution*
Ankit Garg, Mika Göös, Pritish Kamath, Dmitry Sokolov
- Manuscript *Dimension Reduction for Polynomials over Gaussian Space and Applications* [pdf]
Badih Ghazi, Pritish Kamath, Prasad Raghavendra

- CCC 2017 *Query-to-Communication Lifting for P^{NP}* [pdf]
Mika Göös, Pritish Kamath, Toniann Pitassi, Thomas Watson
- ISIT 2017 *Improved bounds for universal 1-bit compressed sensing* [pdf]
Jayadev Acharya, Arnab Bhattacharyya, Pritish Kamath
- Manuscript *The Optimality of Correlated Sampling* [pdf]
Mohammad Bavarian, Badih Ghazi, Elad Haramaty,
Pritish Kamath, Madhu Sudan, Ronald Rivest
- ITCS 2017 *Compression in a Distributed Setting*
Badih Ghazi, Elad Haramaty, Pritish Kamath, Madhu Sudan
- FOCS 2016 *Decidability of non-interactive simulation of joint distributions* [pdf]
Badih Ghazi, Pritish Kamath, Madhu Sudan
- SODA 2016 *Communication complexity of permutation-invariant functions* [pdf]
Badih Ghazi, Pritish Kamath, Madhu Sudan
- RANDOM 2015 *Communication with partial noiseless feedback* [pdf]
Bernhard Haeupler, Pritish Kamath, Ameya Velingker
- FOCS 2013 *Arithmetic circuits: A chasm at depth three* [pdf] (invited to SICOMP)
Ankit Gupta, Pritish Kamath, Neeraj Kayal, Ramprasad Saptharishi
- CCC 2013 *Approaching the chasm at depth four* [pdf] (**Best Paper Award**)
Ankit Gupta, Pritish Kamath, Neeraj Kayal, Ramprasad Saptharishi
- WoLLIC 2012 *Preservation under substructures modulo bounded cores* [pdf]
(*) Abhisekh Sankaran, Bharat Adsul, Vivek Madan, Pritish Kamath, Supratik Chakraborty
- CSL 2012 *Faster algorithms for alternating refinement relations* [pdf]
Krishnendu Chatterjee, Siddhesh Chaubal, Pritish Kamath
- WABI 2011 *Using dominances for solving the protein family identification problem* [pdf]
(*) Noël Malod-Dognin, Mathilde Le Boudic-Jamin, Pritish Kamath, Rumen Andonov

Teaching Experience

- Spring 2017 **Teaching Assistant, MIT**
6.856 : Randomized Algorithms
Instructor: Prof. David Karger
- Spring 2015 **Teaching Assistant, MIT**
6.841 : Advanced Complexity Theory
Instructor: Prof. Dana Moshkovitz
- Spring 2012 **Teaching Assistant, IIT Bombay**
CS 208 : Automata Theory and Logic
Instructor: Prof. Supratik Chakraborty

References

Madhu Sudan

Gordon-McKay Professor
Harvard John A. Paulson School of Engineering and Applied Sciences
✉ madhu@cs.harvard.edu

Ronitt Rubinfeld

Professor
EECS, CSAIL
Massachusetts Institute of Technology
✉ ronitt@csail.mit.edu