## Naman Agarwal


CONTACT INFORMATION

Research Scientist
Google Research, Princeton
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RESEARCH INTERESTS

Optimization for Machine Learning, Decision Making and Control, Privacy for Machine Learning and Data Analysis.

EDUCATION

**Princeton University**, Princeton, NJ, USA
Doctor of Philosphy(PhD) in Computer Science
- GPA: *3.95/4.00*
- Advisor: Dr. Elad Hazan
- Thesis: Second-Order Optimization Methods for Machine Learning

**University of Illinois Urbana-Champaign**, Urbana, IL, USA
Master of Science in Computer Science, May 2014
- GPA : *3.96/4.00*
- Advisor: Dr. Alexandra Kolla
- Masters Thesis: Unique Games Conjecture: the Boolean Hypercube and connections to graph lifts

**IIT Bombay**, Mumbai, India
Bachelor of Technology in Computer Science and Engineering, August 2012
- GPA : *9.48/10.00*
- Advisor: Dr. Abhiram G. Ranade
- Bachelor Thesis: Convergence Analysis of Newton's Method in Draw-CAD

WORK/RESEARCH EXPERIENCE

**Research Scientist**, *Google Research, Princeton* 2018-ongoing

**Research Internship**, *BigML Team, Google Research NYC*
*Privacy and Communication in Large Scale Distributed Machine Learning* Summer 2017

**Research Assistantship**, *supervised by Dr. Elad Hazan*
*Second Order Methods for Optimization in Machine Learning* 2015- ongoing

**Research Internship**, *supervised by Dr. Nikhil Srivastava, Microsoft Research, Bangalore*
*Optimization Approaches for Faster Graph Sparsification* Summer 2014

**Research Assistantship**, *supervised by Dr. Alexandra Kolla, University of Illinois Urbana-Champaign*
*Spectral Graph Theory and Stochastic Networks* 2012-2014

**Research Internship**, *supervised by Dr. Ranjita Bhagwan, Microsoft Research, Bangalore*
*Algorithms for Automated Data Center Design* Summer 2011

**Research Internship**, *supervised by Dr. Stefan Schwoon, LSV, ENS-Cachan* Summer 2010

PREPRINTS

- **Boosting for Dynamical Systems**
  *Naman Agarwal, Nataly Brukhim, Elad Hazan, Zhou Lu*
  Arxiv Link: https://arxiv.org/abs/1906.08720

- **Extreme Tensoring for Low-Memory Preconditioning**
  *Xinyi Chen, Naman Agarwal, Elad Hazan, Cyril Zhang, Yi Zhang*
  Arxiv Link: https://arxiv.org/abs/1902.04620
- **Effective Dimension of Exp-Concave Optimization**
  *Naman Agarwal, Alon Gonen*
  Under Submission
  Arxiv Link: https://arxiv.org/abs/1805.08268
- **Leverage Score Sampling for Faster Accelerated Regression and ERM**
  *Naman Agarwal, Sham Kakade, Rahul Kidambi, Praneeth Nethrapalli, Aaron Sidford, Yin Tat-Lee*
  Under Submission
  Arxiv Link: https://arxiv.org/abs/1711.08426
- **Adaptive regularization with cubics on manifolds**
  *Naman Agarwal, Nicolas Boumal, Brian Bullins, Coralia Cartis*
  Under Submission
  Arxiv Link: https://arxiv.org/abs/1806.00065

PUBLICATIONS

- **Logarithmic Regret for Online Control**
  *Naman Agarwal, Elad Hazan, Karan Singh*
  **Oral Presentation** Conference on Neural Information Processing Systems(NeurIPS), 2019
  Arxiv Link: https://arxiv.org/abs/1902.08721
- **Learning in Non-convex Games with an Optimization Oracle**
  *Naman Agarwal, Alon Gonen, Elad Hazan*
  Conference on Learning Theory(COLT), 2019
  Arxiv Link: https://arxiv.org/abs/1810.07362
- **Online Control with Adversarial Disturbances**
  *Naman Agarwal, Brian Bullins, Elad Hazan, Sham Kakade, Karan Singh*
  International Conference on Machine Learning(ICML), 2019
  Arxiv Link: https://arxiv.org/abs/1902.08721
- **The Case for Full-Matrix Adaptive Regularization**
  *Naman Agarwal, Brian Bullins, Xinyi Chen, Elad Hazan, Karan Singh, Cyril Zhang, Yi Zhang*
  International Conference on Machine Learning(ICML), 2019
  Arxiv Link: https://arxiv.org/pdf/1806.02958.pdf
- **cpSGD: Communication-efficient and differentially-private distributed SGD**
  *Naman Agarwal, Ananda Theertha Suresh, Felix Yu, Sanjiv Kumar, Brendan Mcmahan*
  **Spotlight**, Neural Information Processing Systems, 2018
  Arxiv Link: https://arxiv.org/abs/1805.10559
- **Lower Bounds for Higher-Order Convex Optimization**
  *Naman Agarwal, Elad Hazan*
  Conference on Learning Theory(COLT), 2018
  Arxiv Link: https://arxiv.org/pdf/1710.10329.pdf
- **The Price of Differential Privacy For Online Learning**
  *Naman Agarwal, Karan Singh*
  International Conference on Machine Learning(ICML), 2017
  Arxiv Link: https://arxiv.org/abs/1701.07953
- **Finding Approximate Local Minima for Nonconvex Optimization in Linear Time**
  *Naman Agarwal, Zeyuan Allen-Zhu, Brian Bullins, Elad Hazan, Tengyu Ma*
  Symposium on Theory of Computing (STOC) 2017

Arxiv link : https://arxiv.org/abs/1611.01146

- **Second Order Stochastic Optimization in Linear Time**
  *Naman Agarwal, Brian Bullins, Elad Hazan*
  Journal of Machine Learning Research (JMLR)
  Arxiv link : https://arxiv.org/abs/1602.03943
  Preliminary results presented at the Optimization Methods for the Next Generation of Machine Learning workshop - ICML 2016
  Awarded Honorable Mention for the 2018 Student Paper Prize Competition of the INFORMS Optimization Society

- **On the Expansion of Group-Based Lifts**
  *Naman Agarwal, Karthekeyan Chandrasekaran, Alexandra Kolla, Vivek Madan*
  SIAM Journal on Discrete Mathematics, Volume 33, Issue 3
  $21^{st}$ International Workshop on Randomization and Computation (RANDOM) 2017
  Arxiv link : http://arxiv.org/abs/1311.3268

- **Multisection in the Stochastic Block Model using Semidefinite Programming**
  *Naman Agarwal, Afonso Bandeira, Konstantinos Koiliaris, Alexandra Kolla*
  To appear in Compressed Sensing and Its Applications: Second International MATHEON Conference, 2015
  Arxiv link : http://arxiv.org/abs/1507.02323

- **Unique Games on the Hypercube**
  *Naman Agarwal, Guy Kindler, Alexandra Kolla, Luca Trevisan*
  Chicago Journal of Theoretical Computer Science
  Link : http://cjtcs.cs.uchicago.edu/articles/2015/1/contents.html

## ACADEMIC ACHIEVEMENTS

- Awarded the 2018 Student Paper Prize Competition of the INFORMS Optimization Society, Honorable Mention.
- Selected to receive the Chirag Foundation Graduate Fellowship in Computer Science awarded by the Computer Science Department at University of Illinois Urbana-Champaign.
- Awarded the Student Travel Award to attend the conferences STOC-2013 and CCC-2013.
- Secured an All India Rank 64 in IITJEE 2008 among 300,000 students.
- Secured an All India Rank of 148 in AIEEE 2008 among 8,00,000 students
- Awarded the CBSE Merit Scholarship on the basis of my performance in AIEEE

## TEACHING EXPERIENCE

- Teaching Assistant, CS 423 : Theory of Algorithms – Spring 2016, Princeton University
- Teaching Assistant, CS 402 : Artificial Intelligence – Fall 2015, Princeton University
- Teaching Assistant, CS 461 : Computer Security – Fall 2012, UIUC
- Teaching Assistant, CS 420 : Graph Theory – Spring 2012, IIT Bombay

## PROGRAMMING SKILLS

- Deep Learning in TensorFlow, Python
- Java, C++, MATLAB

## PROFESSIONAL SERVICE

- Program Committee Member - ALT 2019.
- Reviewer for ICLR 2019, NIPS 2018, ICML 2018, NIPS 2017, COLT 2017, COLT 2016, Journal of Machine Learning Research, Mathematical Programming, Theory of Computing.