Shivam Gupta

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EDUCATION

University of Texas at Austin (UT Austin) Aug 2018 – Present
Ph.D. in Computer Science (Advisor: Eric Price)

University of Illinois at Urbana-Champaign (UIUC) May 2018
B.S. in Computer Science, Minor in Mathematics

INTERESTS

Diffusion Models, Statistics, Machine Learning, related topics

EXPERIENCE

Massachusetts Institute of Technology *Cambridge, MA*
Visiting Student (Host: Sam Hopkins) Jun 2023 – Aug 2023
- Worked on proving sharper rates for high-probability mean estimation

University of California, Berkeley *Berkeley, CA*
Visiting Student Researcher Aug 2022 – May 2023
- Developed theory for diffusion models, and wrote experiments to improve understanding
- Developed new mean and location estimation algorithms

Sigma Computing, Inc. *San Francisco, CA*
Research Intern May 2022 – Aug 2022
- Worked on designing and implementing anomaly detection algorithms for various datasets

University of Wisconsin, Madison *Madison, WI*
Research Intern (Host: Ilias Diakonikolas) May 2020 – Aug 2020
- Studied gradient descent algorithms to robustly estimate the mean of a high-dimensional Gaussian
- Wrote experiments for outlier-robust sparse estimation in Python and Numpy

Jane Street *New York, NY*
Software Developer Intern May 2016 – Aug 2016
- Wrote server code to employ state machine replication to send and receive data via RPCs
- Developed a market data parser in OCaml

Bloomberg L.P. *New York, NY*
R&D Intern May 2015 – Aug 2015
- Developed real-time system for Bloomberg Terminal to track messages between services in C++

CURRENT PROJECTS

Diffusion model for noisy training samples (with Eric Price) Oct 2023 – Present
- Developing algorithm to sample clean images from a diffusion model trained on noisy data

Posterior Sampling for Diffusion models (with Eric Price, others) Oct 2023 – Present
- Proving lower bounds and working on algorithms for posterior sampling for diffusion models given noisy linear measurements

PAPERS

9. **Beyond Catoni: Sharper Rates for Heavy-Tailed and Robust Mean Estimation**
   Shivam Gupta, Samuel B. Hopkins, Eric Price
   In preparation
8. **Sample-Efficient Training for Diffusion**
   Shivam Gupta, Aditya Parulekar, Eric Price, Zhiyang Xun
   In submission
7. **Minimax-Optimal Location Estimation**
   Shivam Gupta, Jasper C.H. Lee, Eric Price, Paul Valiant
   Neural Information Processing Systems (NeurIPS) 2023
6. **Finite-Sample Symmetric Mean Estimation with Fisher Information Rate**
   Shivam Gupta, Jasper C.H. Lee, Eric Price
   Conference on Learning Theory (COLT) 2023
5. **High-dimensional Location Estimation via Norm Concentration for Subgamma Vectors**
   Shivam Gupta, Jasper C.H. Lee, Eric Price
   International Conference on Machine Learning (ICML) 2023

4. **Finite-Sample Maximum Likelihood Estimation of Location**
   Shivam Gupta, Jasper C.H. Lee, Eric Price, Paul Valiant
   Neural Information Processing Systems (NeurIPS) 2022
3. **Outlier-Robust Sparse Estimation via Non-Convex Optimization**
   Yu Cheng, Ilias Diakonikolas, Rong Ge, Shivam Gupta, Daniel Kane, Mahdi Soltanolkotabi
   Neural Information Processing Systems (NeurIPS) 2022
2. **Sharp Constants in Uniformity Testing via the Huber Statistic**
   Shivam Gupta, Eric Price
   Conference on Learning Theory (COLT) 2022
1. **Nash Equilibrium Computation in Resource Allocation Games**
   Shivam Gupta, Ruta Mehta
   International Conference on Autonomous Agents and Multiagent Systems (AAMAS) 2018

SELECTED AWARDS

- C.W. Gear Outstanding Undergraduate Student Award 2018
- Conference Travel Grant 2018 (for travel to AAMAS)
- Horace and Kate King Wu International Undergraduate Scholarship 2018
- Illinois Engineering Achievement Scholarship 2017
- NTT Data, Inc., Scholarship 2015, 2016
- Franz Hohn and J.P. Nash Scholarship 2015 (for research in scientific computing)
- Perfect score in the Indian National Olympiad in Informatics, and selected as one of 26 students in India to attend the International Olympiad in Informatics training camp 2014
- ACM ICPC Mid-Central Regional: Team placed 6^{th} in 2017, 4^{th} in 2016
- Represented India in SEARCC Software Competition 2013, Colombo, Sri Lanka, and placed 3^{rd}
- Placed 2^{nd} in Dropbox Open programming contest 2015 at UIUC
- Won Bloomberg CodeCon Challenge and invited to CppCon 2015 in Bellevue, Washington
- Won 3Red Trading Tech Challenge in 2015 and 2016 and invited to Chicago

TALKS

- **Sample-Efficient Training for Diffusion** November 2023
  IFML Workshop on Generative AI, UT Austin
- **A Finite-Sample Theory for Mean Estimation with Fisher Information Rate** October 2023
  MIT Algorithms and Complexity Seminar
- **A Finite-Sample Theory for Mean Estimation with Fisher Information Rate** October 2023
  CMU Theory Lunch
- **Finite-Sample Symmetric Mean Estimation with Fisher Information Rate** July 2023
  Conference on Learning Theory, Bangalore, India

TEACHING

At UT Austin:

- *Teaching Assistant*, Sublinear Algorithms (CS 395T) Fall 2020
- *Teaching Assistant*, Introduction to Algorithms (CS 331) Spring 2019
- *Teaching Assistant*, Machine Learning (CS 395T) Summer 2019, Fall 2019
- *Teaching Assistant*, Elements of Data Analytics (CS 329E) Spring 2019
- *Teaching Assistant*, Sublinear Algorithms (CS 395T) Fall 2018

At UIUC:

- *Course Assistant*, Introduction to Algorithms (CS 374) Spring 2018
- *Grader*, Algorithms II (CS 473) Spring 2018

SKILLS

- *Languages:* C/C++, Python, Java, OCaml, Haskell, JavaScript, HTML, CSS
- *Software and Libraries:* NumPy, SciPy, PyTorch, Mathematica, LaTeX

REVIEWING

SODA 2021, 2024; NeurIPS 2023; ITCS 2024; ALT 2024; ICLR 2024

RELEVANT COURSES

Probability and Stochastic Processes, Learning Theory, Coding Theory, Theoretical Statistics, Randomized Algorithms, Markov Chains and Mixing Time, Approximation Algorithms, Combinatorial Mathematics, Numerical Linear Algebra, Wireless Networking