Sushrut Karmalkar

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Education

The University of Texas at Austin (UT Austin), Austin, TX, USA
Ph.D. in Computer Science, School of Computer Science 2021
Advisor: Prof. Adam Klivans

Chennai Mathematical Institute (CMI), Chennai, India
M.Sc. in Computer Science 2016
B.Sc. (Hons.) in Mathematics and Computer Science 2014

Websites

Homepage `https://sushrutk.github.io/`
Google Scholar `https://scholar.google.com/citations?user=NLW1g68AAAAJ&hl=en`

Research Interests

Machine Learning, Statistics, Theoretical Computer Science

Work Experience

Microsoft Research Cambridge
Senior Researcher, October 2025 -

Working on developing principled algorithms for sampling and generalization for language models.

The University of Wisconsin at Madison
Research Associate, September 2021 - June 2024

NSF-Computing Innovation Fellow with Prof. Ilias Diakonikolas.

Simons Institute for the Theory of Computing, Berkeley
Long-term Visitor, Fall 2021

Visiting postdoctoral fellow for the program on the "Computational Complexity of Statistical Inference".

Institute of Advanced Study, Princeton
Visiting Student, Fall 2019

Visiting graduate student for the "Special Year on Optimization, Statistics, and Theoretical Machine Learning".

University of Southern California
Visiting Student, Summer 2019

Worked on robustly clustering Gaussians with Prof. Ilias Diakonikolas and Dr. Samuel B. Hopkins and visited the Simons workshop on Deep Learning.

Microsoft Research, India
Research Intern, Summer 2017

Worked on problems related to the concentration of fourier mass on low-degree fourier coefficients of boolean functions with Dr. Satya Lokam and on depth separation results for neural networks with Dr. Amit Deshpande.

Microsoft Research, India
Research Intern, Summer 2015

Worked on problems related to threshold circuits and neural networks with Dr. Amit Deshpande.

Preprints/Manuscripts

$^{\alpha}$ Indicates alphabetical ordering, as is the convention in theoretical computer science.

1. **A Fourier Space Perspective on Diffusion Models**
   Fabian Falck, Teodora Pandeva, Kiarash Zahirnia, Rachel Lawrence, Richard E. Turner, Edward Meeds, Javier Zazo, Sushrut Karmalkar

Publications

$^{\alpha}$ Indicates alphabetical ordering, as is the convention in theoretical computer science.
$*$ Indicates equal first-author contribution.

1. **Batch List-Decodable Linear Regression via Higher Moments** ICML 2025
   Ilias Diakonikolas$^{\alpha}$, Daniel M. Kane$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$, Sihan Liu$^{\alpha}$ and Thanasis Pittas$^{\alpha}$
2. **Sum-of-Squares Lower Bounds for Non-Gaussian Component Analysis** FOCS 2024
   Ilias Diakonikolas$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$, Shuo Pang$^{\alpha}$ and Aaron Potechin$^{\alpha}$
3. **Robust Sparse Estimation for Gaussians with Optimal Error under Huber Contamination** ICML 2024
   Ilias Diakonikolas$^{\alpha}$, Daniel M. Kane$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$, Ankit Pensia$^{\alpha}$ and Thanasis Pittas$^{\alpha}$
4. **Multi-Model 3D Registration: Finding Multiple Moving Objects in Cluttered Point Clouds** ICRA 2024
   David Jin, **Sushrut Karmalkar**, Harry Zhang and Luca Carlone
5. **First Order Stochastic Optimization with Oblivious Noise** NeurIPS 2023
   Ilias Diakonikolas$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$, Jongho Park$^{\alpha}$ and Christos Tzamos$^{\alpha}$
6. **Distribution-Independent Regression for Generalized Linear Models with Oblivious Corruptions** COLT 2023
   Ilias Diakonikolas$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$, Jongho Park$^{\alpha}$ and Christos Tzamos$^{\alpha}$
7. **List-Decodable Sparse Mean Estimation via Difference-of-Pairs Filtering** NeurIPS 2022 (Oral)
   Ilias Diakonikolas$^{\alpha}$, Daniel M. Kane$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$, Ankit Pensia$^{\alpha}$ and Thanasis Pittas$^{\alpha}$
8. **Robust Sparse Mean Estimation via Sum of Squares** COLT 2022
   Ilias Diakonikolas$^{\alpha}$, Daniel M. Kane$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$, Ankit Pensia$^{\alpha}$ and Thanasis Pittas$^{\alpha}$
9. **Fairness for Image Generation with Uncertain Sensitive Attributes** ICML 2021
   Ajil Jalal*, **Sushrut Karmalkar***, Jessica Hoffman* , Alexandros Dimakis, Eric Price
10. **Optimal Sample Complexity for Compressed Sensing with Approximate Generative Priors** ICML 2021
    Ajil Jalal, **Sushrut Karmalkar**, Alexandros Dimakis, Eric Price
11. **Approximation Schemes for ReLU Regression** COLT 2020
    Ilias Diakonikolas$^{\alpha}$, Surbhi Goel$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$, Adam Klivans$^{\alpha}$, Mahdi Soltanolkotabi$^{\alpha}$
12. **Superpolynomial Lower Bounds for Learning One-Layer Neural Networks using Gradient Descent** ICML 2020
    Surbhi Goel$^{\alpha}$, Aravind Gollakota$^{\alpha}$, Zhihan Jin$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$, Adam Klivans$^{\alpha}$
13. **Robustly Learning any Clusterable Mixture of Gaussians** FOCS 2020
    Ilias Diakonikolas$^{\alpha}$, Samuel B. Hopkins$^{\alpha}$, Daniel Kane$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$
    Conference version merged with: Bakshi, Kothari. Outlier-Robust Clustering of Non-Spherical Mixtures.
14. **Lower Bounds for Compressed Sensing with Generative Models** ICML 2020
    Akshay Kamath$^{\alpha}$, Sushrut Karmalkar$^{\alpha}$, Eric Price$^{\alpha}$
15. **List-decodable Linear Regression** NeurIPS 2019 (Spotlight)
    Sushrut Karmalkar$^{\alpha}$, Adam Klivans$^{\alpha}$, Pravesh Kothari$^{\alpha}$
16. **Time/Accuracy Tradeoffs for Learning a ReLU with respect to Gaussian Marginals** NeurIPS 2019 (Spotlight)
    Surbhi Goel$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$, Adam Klivans$^{\alpha}$
17. **Outlier-Robust High-Dimensional Sparse Estimation via Iterative Filtering** NeurIPS 2019
    Ilias Diakonikolas$^{\alpha}$, Daniel Kane$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$, Eric Price$^{\alpha}$, Alistair Stewart$^{\alpha}$
18. **Compressed Sensing with Adversarial Sparse Noise via L1 Regression** SOSA 2019
    Sushrut Karmalkar$^{\alpha}$, Eric Price$^{\alpha}$
19. **Fourier Entropy-Influence Conjecture for Random Linear Threshold Functions** LATIN 2018
    Sourav Chakraborty$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$, Srijita Kundu$^{\alpha}$, Satyanarayana V. Lokam$^{\alpha}$, Nitin Saurabh$^{\alpha}$
20. **Depth separation and weight-width trade-offs for sigmoidal neural networks** ICLR 2018, Workshop
    Amit Deshpande$^{\alpha}$, Navin Goyal$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$
21. **Robust Polynomial Regression up to the Information Theoretic Limit** FOCS 2017
    Daniel Kane$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$, Eric Price$^{\alpha}$
22. **On Robust Concepts and Small Neural Nets** ICLR 2017, Workshop
    Amit Deshpande$^{\alpha}$, **Sushrut Karmalkar**$^{\alpha}$

Reviewing

COLT 2019, 2020, 2022 (Junior Program Committee member); ALT 2020, 2022; FOCS 2019; STOC 2020, 2022, 2023; ISIT 2019, 2021; ICLR 2019, 2022; ICML 2022

Teaching Experience

CS311 Discrete Mathematics for Computer Science, The University of Texas at Austin	Fall 2016, 2017, Spring 2017
CS331 Algorithms, The University of Texas at Austin	Spring 2016
Design and Analysis of Algorithms, Chennai Mathematical Institute (NPTEL MOOC Course)	Spring 2015
Data Mining and Machine Learning, Chennai Mathematical Institute	Fall 2013

Programming Languages

Python (Intermediate), C++ (Beginner)

Honors and Scholarships

NSF-Computing Innovation Postdoctoral Fellowship (2021-23)	CRA/NSF
Continuing Graduate Fellowship (2020-21)	UT Austin
Professional development award for conference travel (2018, 2019)	UT Austin
Graduate School Summer Fellowship (2018)	UT Austin
Scholarship for Master's students	CMI
Scholarship for Undergraduate students	CMI

Service

Served as an executive committee member on the Graduate Representative Association of Computer Sciences from 2017-2019.
Organizer for the reading group on 'Cryptographic Lower Bounds for Machine Learning Problems' during the program on the 'Computational Complexity of Statistical Inference' at the Simons Institute for the Theory of Computing in Fall 2021.
Organizer for the 'TRIPODS Postdoc Workshop' at TTIC, August 21-23, 2023.