Arnab Auddy

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Academic Positions

The Ohio State University — Columbus, USA
Assistant Professor in Statistics — August 2024-Present

University of Pennsylvania — Philadelphia, USA
Postdoctoral Researcher in Biostatistics — August 2023-July 2024

Education

Columbia University — New York, USA
Ph.D. in Statistics (with specialization in Data Science), Advisor: Ming Yuan — September 2018–June 2023

- GPA: 4.06

Indian Statistical Institute — Kolkata, India
M.Stat., with Distinction — July 2016–June 2018

- Specialization: Theoretical Statistics

Indian Statistical Institute — Kolkata, India
B.Stat., with Distinction — July 2013–June 2016

Research Interests

I am interested in solving complex data analysis problems at the intersection of Statistics, Optimization and theoretical Computer Science. More specifically, my research is on the use of spectral methods for high dimensional data analysis, and statistical and computational trade-offs arising therein. I have also worked on modern machine learning and single cell genomics.

Preprints and Publications

1. KhudaBukhsh, W. R., **Auddy, A.**, Disser, Y., & Koeppl, H. (2018). Approximate lumpability for Markovian agent-based models using local symmetries. *Journal of Applied Probability*, 56 (3), 647-671.

2. **Auddy, A.**, & Yuan, M. (2020). Perturbation Bounds for (Nearly) Orthogonally Decomposable Tensors with Statistical Applications. *Information and Inference: A Journal of the IMA*, 12(2), 1044-1072.

3. **Auddy, A.**, & Yuan, M. (2021). On Estimating Rank-one Spiked Tensors in the Presence of Heavy Tailed Errors. *IEEE Transactions on Information Theory*, 68(12), 8053-8075.

4. Bhattacharyya, R., et al. (2021). Role of Multi-resolution Vulnerability Indices in COVID-19 spread: A Case Study in India. *British Medical Journal Open*, 12(11), e056292.

5. **Auddy, A.**, Deb, N. & Nandy, S. (2021). Exact Detection Thresholds for Chatterjee's Correlation. *arXiv preprint arXiv: 2104.15140*, accepted by *Bernoulli*

6. **Auddy, A.**, & Yuan, M. (2022). Tucker Decomposition with Sparsity in the Core: Identifiability, Stability and Computability. available upon request

7. **Auddy, A.**, & Yuan, M. (2023). Large Dimensional Independent Component Analysis: Statistical Optimality and Computational Tractability. *arXiv preprint arXiv:2303.18156*, accepted by *The Annals of Statistics*

8. Arya, S., **Auddy, A.**, Edmonds, R., Lim, S., Memoli, F., Packer, D. (2023). The Gromov-Wasserstein distance between spheres. *arXiv preprint arXiv:2306.10586.*, accepted by *Foundations of Computational Mathematics*

9. **Auddy, A.**, Zou, H., Rahnama Rad, K. & Maleki, A. (2023+). Approximate Leave-one-out Cross Validation for Regression with ℓ_1 Regularizers. *arXiv preprint arXiv:2310.17629.*, accepted by *International Conference on Artificial Intelligence and Statistics (AISTATS) 2024*

10. Zou, H., **Auddy, A.**, Rahnama Rad, K. & Maleki, A. (2024+). Theoretical Analysis of Leave-one-out Cross Validation for Non-differentiable Penalties under High-dimensional Settings. *arXiv preprint arXiv:2402.08543.*

11. **Auddy, A.**, Cai, T. Tony, & Li, H. (2024+). Regressing Multivariate Gaussian Distribution on Vector Covariates for Co-expression Network Analysis. *http://www-stat.wharton.upenn.edu/ tcai/paper/Frechet-regression.pdf.*

12. **Auddy, A.**, Xia, D., & Yuan, M. (2024+). Tensor Methods in High Dimensional Data Analysis: Opportunities and Challenges. *arXiv preprint arXiv:2405.18412.*

13. **Auddy, A.**, Cai, T. Tony, & Chakraborty, A. (2024+). Minimax And Adaptive Transfer Learning for Nonparametric Classification under Distributed Differential Privacy Constraints. *arXiv preprint arXiv:2406.20088.*

14. **Auddy, A.**, Deb, N. & Sen, B. (2024+). Statistical Inference for the Fourth Order Blind Identification Estimator in High Dimensions. in preparation

Honors and Awards

- Course Assistant award from Columbia Data Science Institute 2022
- Ph.D. scholarship: Dean's fellow at Columbia University 2018–2023
- Prize money for good academic performance in M.Stat. 2017
- KVPY fellowship (stream SA), from Department of Science and Technology, Government of India 2013–2018
- Runner up in the **CRISIL** Young Thought Leader Essay Competition 2016
- Ranked in the top 1 percent among 40721 students in National Standard Exam in Physics (NSEP) 2013

Invited Talks

- Why and How to use Orthogonally Decomposable Tensors,
  - ENAR Spring Meeting, March 2022, Houston TX
  - Statistical Learning Reading Group, September 2022, Statistics department, Ohio State University
- High Dimensional Data Analysis using Orthogonally Decomposable Tensors,
  - IMS Annual Meeting, June 2022, London UK
  - Yale FDS Seminar, January 2023
  - OSU Statistics Seminar, February 2023
- Statistical and Computational Tradeoffs in Statistical Inference using Orthogonally Decomposable Tensors, INFORMS, October 2022, Indianapolis IN
- Computational and Statistical Limits in High Dimensional Independent Component Analysis,
  - CMStatistics, December 2022, London UK
  - ICSA Applied Statistics Symposium, June 2023, Ann Arbor MI

- Gromov Wasserstein distances for uniformly distributed points on spheres,
  Joint Mathematics Meeting, January 2023, Boston US
- Regressing Multivariate Gaussian Distribution on Vector Covariates for Co-expression Network Analysis,
  - BIRS Workshop, May 2024, Banff, Canada
  - WNAR, June 2024, Fort Collins CO

Contributed Talks

- Perturbation Bounds for Odeco Tensors, JSM 2020 (virtual)
- Why and how to use Orthogonally Decomposable Odeco Tensors, NISS 2022 (virtual)

Workshops

- Data Science at the Crossroads of Analysis, Topology and Geometry, AMS MRC, Buffalo NY — June 2022
- SIAM Conference on Algebraic Geometry in Bern — July 2019
- Workshop on 'Challenges in High-dimensional Data' at Columbia University — September 2018

Teaching and Teaching Assistantship

I have taught the following course:

- Introduction to Statistics without Calculus (undergrad) — Summer 2022

I have been the teaching assistant on the following courses. My responsibilities included helping students with coursework and software applications, as well as grading and holding recitation sessions.

- Statistical Inference II (Ph.D. level) — Spring 2023
- Statistical Inference (Masters level) — Fall 2022
- Statistical Inference and Modeling (Masters level) — Fall 2021, Spring 2022
  Received the Course Assistant award from Columbia Data Science Institute
- Multivariate Statistical Methods (Masters level) — Spring 2021
- Linear Regression Models (Masters level) — Fall 2020
- Generalized Linear Models (Masters level) — Spring 2020
- Bayesian Statistics (Masters level) — Fall 2019
- Nonparametric Statistics (Masters level) — Spring 2019
- Probability and Inference (Masters level) — Fall 2018

Industry Experience

- **Amazon** (Summer 2021): Research Scientist Intern. Worked on causal inference and empirical Bayes noise reduction with the Marketing Measurement team.

Services

- I have reviewed papers for Annals of Statistics, IEEE- Trans. Inf. Theory, IEEE Trans. Signal Process., Bernoulli, Statistics and Probability Letters, and SODA (conference).
- I have co-organized the Stats department student seminar in 2021-22.

Skills

- **Statistical softwares:** R (advanced), Python (intermediate)
- **Languages:** Fluent in English, Bengali and Hindi. Elementary knowledge of French.