Arnab Auddy

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Academic Positions

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 — Fall 2018–Summer 2023

- GPA: 4.06

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

- Specialization: Theoretical Statistics

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

Research Interests

In my Ph.D. I have worked on problems at the intersection of Statistics, Optimization and theoretical Computer Science. More specifically, my research is on tensors and the statistical and computational trade-offs appearing in the application of tensor methods. I am broadly interested in spectral methods for high dimensional data analysis. I have also worked on detection thresholds of some nonparametric methods.

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.*

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.*

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.