Debarghya Mukherjee

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AREAS OF INTEREST

- High dimensional statistical inference
- Theory of machine learning algorithms
- Empirical process theory
- Non-standard asymptotics

EDUCATION AND PROFESSION

Assistant Professor **September 2023 - Present**
Boston University, Department of Mathematics and Statistics, Boston, MA

Postdoctoral researcher in statistics **September 2022 - August 2023**
Princeton University, ORFE, Princeton, NJ
Advisors: Prof. Jianqing Fan.

PhD in Statistics **Fall 2017 - August 2022**
University of Michigan, Ann Arbor
Advisors: Prof. Moulinath Banerjee and Prof. Ya'acov Ritov.

Master of Statistics **August 2017**
Indian Statistical Institute, Kolkata, India

Bachelor of Statistics **August 2015**
Indian Statistical Institute, Kolkata, India

AWARDS

1. Received Computing and Data Science (CDS) fellowship at Boston University in 2023.
2. Received **Best dissertation award** in University of Michigan for my thesis in 2022.
3. Received **Best Speed Oral Presentation** award in Michigan Student Symposium for Interdisciplinary Statistical Sciences, 2021.
4. Received **Propelling Original Data Science (PODS) Mini-Grants for COVID-19 Research** which is co-written with Hamid Eftekhari, Moulinath Banerjee and Ya'acov Ritov.
5. Received **Outstanding** 1^{st} **year Ph.D. student award** from Department of Statistics, University of Michigan.
6. Received **ISIAA-MRS M.R. Iyer Gold Medal Award** for being the top performer in Master of Statistics from Indian Statistical Institute.

PUBLICATION AND ONGOING PROJECTS

JOURNAL PUBLICATIONS

- **Optimal linear discriminators for the discrete choice model in growing dimensions**.
  ▶With Moulinath Banerjee and Ya'acov Ritov, *accepted* in the Annals of Statistics. (Arxiv link)

- **On robust learning in the canonical change point problem under heavy tailed errors in finite and growing dimensions.**

  ▶ Joint with Moulinath Banerjee and Ya'acov Ritov, *accepted* in the Electronic Journal of Statistics. (Arxiv link)

- **Asymptotic normality of a linear threshold estimator in fixed dimension with near-optimal rate**.
  ▶ Joint with Moulinath Banerjee and Ya'acov Ritov, *accepted* in the Electronic Journal of Statistics. (Arxiv link)

- **Deep Neural Networks for Nonparametric Interaction Models with Diverging Dimension**.

  ▶With Sohom Bhattacharya and Jianqing Fan, *accepted* at Annals of Statistics.(Arxiv link)

- **Estimation of a score-explained non-randomized treatment effect in fixed and high dimensions**.

  ▶With Moulinath Banerjee and Ya'acov Ritov, *accepted* at Bernuolli. (Arxiv link)

CONFERENCE PUBLICATIONS

- **Two simple ways to learn individual fairness metrics from data**.

  ▶ With Moulinath Banerjee, Yuekai Sun and Mikhail Yurochkin, *accepted* in the International Conference on Machine Learning, 2020. (Arxiv link)

- **Does enforcing fairness mitigate biases caused by subpopulation shift?**

  ▶With Subha Maity, Yuekai Sun and Mikhail Yurochkin, *accepted* in the Neural Information Processing System, 2021. (Arxiv link)

- **Outlier-Robust Optimal Transport.**

  ▶With Aritra Guha, Justin Solomon, Yuekai Sun and Mikhail Yurochkin, *accepted* in the International Conference on Machine Learning, 2021. (Arxiv link)

- **Post-processing for Individual Fairness.**

  ▶ With Felix Petersen, Yuekai Sun and Mikhail Yurochkin, *accepted* in the Neural Information Processing System, 2021. (Arxiv link)

- **Predictor-corrector algorithms for stochastic optimization under gradual distribution shift.**

  ▶ With Subha Maity, Moulinath Banerjee and Yuekai Sun, *accepted* in the International Conference for Learning Representation, 2023. (Arxiv link)

- **Domain adaptation meets Individual Fairness. And they get along**.

  ▶ With Felix Petersen, Yuekai Sun and Mikhail Yurochkin, *accepted* in the Neural Information Processing System, 2022. (Arxiv link)

- **Optimal Aggregation of Prediction Intervals under Unsupervised Domain Shift**.

  ▶With Jianqing Fan and Jiawei Ge, *accepted* in the Neural Information Processing System, 2024.(Arxiv link)

PREPRINT

- **Transfer Learning Under High-Dimensional Graph Convolutional Regression Model for Node Classification**.

  ▶With Huimin Cheng and others, *Under Review at International Conference at Learning Theory, 2025.*

- **BAE: A Bounded Approximation of the Evidence**.

  ▶With Felix Petersen and others.

- **Minimax Optimal rates of convergence in the shuffled regression, unlinked regression, and deconvolution under vanishing noise**.

  ▶With Cecile Durot, *Under Review at Bernoulli.*(Arxiv link)

- **Trade-off Between Dependence and Complexity for Nonparametric Learning – an Empirical Process Approach**.

  ▶With Nabarun Deb, *Under Review at Annals of Statistics.*(Arxiv link)

- **UTOPIA: Universally Trainable Optimal Prediction Intervals Aggregation**.

  ▶With Jianqing Fan and Jiawei Ge, *Under Review at Annals of Statistics.*(Arxiv link)

- **Markovian And non-Markovian processes with active decision making strategies for addressing the COVID-19 pandemic**.

  ▶With Hamid Eftekhari, Moulinath Banerjee and Ya'acov Ritov. (Arxiv link)

PROFESSIONAL EXPERIENCES

- ***IBM*** *Cambridge, MA, USA.* (Summer internship) **June 2020 - August 2020**

  I worked on a project to develop a robust version of optimal transport plan. Our findings (this paper) are published in the International Conference on Machine Learning 2021.

- ***Dynamic Digital Technology*** *Kolkata, India.* (Summer internship) **May 2016 - July 2016**

  I worked on a Bayesian estimation method to determine anomalous web sessions, which helped to detect new attacks without knowing their characteristics in advance (based on Friedman and Singer, 1999).

TEACHING AND MENTORING EXPERIENCES

COURSE INSTRUCTOR

- Taught **MA - 113** (undergraduate level course) at Boston University in Fall 2024 on Introduction to Statistics.
- Taught **MA - 576** (graduate level course) at Boston University in Spring 2024 on the generalized linear model.
- Taught **MA - 881** (seminar level course) at Boston University in Fall 2023 on empirical process theory and concentration inequalities in learning theory.
- Taught **ORF-245** at Princeton University in Fall 2022 on undergraduate-level statistics.

STUDENT MENTORING

- Currently guiding three students for their Ph.D. thesis.
- Co-guided one undergraduate student for thesis jointly with Prof. Ya'acov Ritov.
- Co-guided two undergraduate students for **Winter 2021 Undergraduate Research Program in Statistics** jointly with Prof. Ya'acov Ritov.

PRESENTATIONS

1. Presented my work on **Optimal linear discriminators for the discrete choice model in growing dimensions** (Based on this paper) at the Joint Statistical Meeting, 2019.
2. Presented my work based on this paper at the 13^{th} international conference on Computational and Methodological Statistics, 2020 as an **invited speaker**.
3. Presented my work on **Two simple ways to learn individual fairness metrics from data** (based on this paper) at the International Conference on Machine Learning, 2020.
4. Presented my work on **Outlier-Robust Optimal Transport** (based on this paper) at the International Conference on Machine Learning, 2021.
5. Presented my work on **Deep Neural Networks for Nonparametric Interaction Models with Diverging Dimension** (Based on this paper) at IISA, 2023.
6. Presented my work on **Domain adaptation meets Individual Fairness. And they get along** (Based on this paper) at INFORMS 2023.
7. Presented my work on **Domain adaptation meets Individual Fairness. And they get along** (Based on this paper) at ICSDS 2023.
8. Presented my work on **Deep Neural Networks for Nonparametric Interaction Models with Diverging Dimension** (Based on this paper) at Indian Statistical Institute (January 2024).
9. Presented my work on **UTOPIA: Universally Trainable Optimal Prediction Intervals Aggregation** (Based on this paper) at Wells Fargo (May 2024).
10. Served as a panelist in a discussion panel on the career in academia in the New England Statistics Symposium (May 2024).
11. Presented my work on **Trade-off Between Dependence and Complexity for Nonparametric Learning – an Empirical Process Approach** (Based on this paper) at Joint Statistical Meeting (August, 2024).

12. Presented my work on **Minimax Optimal rates of convergence in the shuffled regression, unlinked regression, and deconvolution under vanishing noise** (Based on this paper) at CMStatistics conference (London, December 2024)
13. Presented my work on **On the estimation rate of Bayesian PINN for inverse problems** (Based on this paper) at IISA conference (December, 2024).

SERVICES

1. Served in hiring committee for AI cluster hiring at Boston University.
2. Currently serving as the head of the seminar committee of the Department of Mathematics and Statistics at Boston University.
3. Served as the student seminar organizer in the Winter 2020 and 2021 semesters.
4. Refereed papers for around 20 different journals and conferences (including Annals of Statistics, Journal of American Statistical Association, Biometrika, Bernoulli, Neural Informal Processing System, International Conference on Learning Theory, etc.).

COMPUTING SKILLS

1. **Platforms**: Windows, MAC and Linux.
2. **Languages**: Matlab, R, Julia, python (including tensorflow, pytorch, and related modules).
3. Experienced in working on cluster-based systems:
    - Greatlakes, the cluster of University of Michigan
    - IBM cluster (during my summer internship)
    - Google cloud.