Medha Agarwal

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Expected Graduation Date: 11/2026

Education

Aug 2026 — **PhD, Statistics (Machine Learning and Big Data Track)**
University of Washington
Advisor: Alex Luedtke, Zaid Harchaoui
Coursework: Optimal transport & gradient flows, Machine Learning for Big Data, Regression Methods, Statistical Inference, Statistical Learning, Probability Theory, Statistical Consulting.

May 2021 — **Bachelor in Science, Mathematics and Scientific Computing**
Indian Institute of Technology Kanpur
Advisor: Dootika Vats | Minor: English Literature
Coursework: Sampling and Data Analysis, Markov chain Monte Carlo, Data Structures and Algorithms, Stochastic Processes, Bayesian Statistics, Probability Theory, Real & Complex Analysis, Abstract Algebra, Multivariate Calculus, Ordinary Differential Equations, Set Theory.

Work Experience

Summer 2025 - Present — **Abrahms Lab** — *Seattle, WA*
Research Intern, Advisor: Briana Abrahms
- Developed a self-supervised representation learning and transfer learning pipeline for behavior prediction from 10+ years of multimodal wildlife sensor data (audio, video, acceleration, GPS).
- Proposed an uncertainty quantification method for inference under distribution shift.

Summer 2024 — **Amazon Science** — *New York City, NY*
Applied Scientist Intern
- Built a multi-horizon probabilistic forecasting model for multivariate demand time series using MQ-CNN, a neural seq-to-seq architecture.
- Achieved >95% empirical coverage on 5+ years of production-scale demand data.

Summer 2023 — **Amazon Science** — *Bellevue, WA*
Applied Scientist Intern
- Developed a reinforcement learning using human feedback (RLHF) pretraining pipeline for foundational LLMs (40B model), integrating human preferences with product description text corpora.
- Project paper featured in **Amazon Machine Learning Conference 2023**.

2021-Present — **University of Washington** — *Seattle, WA*
Predoc Researcher
- Optimal transport and gradient flows for understanding the fundamentals of generative models.
- Hypothesis testing for equality of counterfactual distributions in causal inference.
- Deep learning methods for multi-modal wildlife sensor data (audio, video, GPS, acceleration).

Summer 2020 — **Duke University** — *Durham, NC*
Research Intern, Advisor: Jason Xu
- Accelerated monotonic optimization algorithms using quasi-Newton methods.

Summer 2020 — **University of Edinburgh** — *Edinburgh, Scotland*
Research Intern, Advisor: Victor Elvira
- Proposed an asymptotically valid convergence diagnostic and stopping rule for importance sampling, improving reliability of Monte Carlo estimators under heavy-tailed distributions.

Publications

- **Medha Agarwal**, K. Rafiq, R. Mehta, B. Abrahms, and Z. Harchaoui. Leveraging machine learning and accelerometry to classify animal behaviours with uncertainty. *bioRxiv*, 2024
  Accepted at: Methods in Ecology and Evolution
- **Medha Agarwal**, Z. Harchaoui, G. Mulcahy, and S. Pal. Langevin diffusion approximation to same marginal Schrödinger bridge. *arXiv*, 2025
  Under peer review at: Journal of Functional Analysis
- **Medha Agarwal** and J. Xu. Quasi-Newton Acceleration of EM and MM Algorithms via Broyden's Method. *Journal of Computational and Graphical Statistics*, 2023
- **Medha Agarwal**, D. Vats, and V. Elvira. A principled stopping rule for importance sampling. *Electronic Journal of Statistics*, 2022
- **Medha Agarwal** and D. Vats. Globally Centered Autocovariances in MCMC. *Journal of Computational and Graphical Statistics*, 2022

Software & Datsets

2025	Dataset for **AWD Biologging**	[Zenodo]
2024	Code for **AWD Biologging**	[GitHub]
2024	Code for **Schrödinger Bridge Scheme**	[GitHub]
2023	Code for **Brenier Potential Flow**	[GitHub]
2020	**R package `quasiNewtonMM`**	[GitHub]
2020	**R package `multichainACF`**	[GitHub]

Academic Achievements and Scholarships

2025 Graduate Student Conference Presentation Award, University of Washington

2024 Winner, Student Paper Competition, ASA Conference on Statistical Learning and Data Science

2023 Finalist, Two-Sigma PhD Fellowship Program

2023 Hannan Graduate Student Award, Institute of Mathematical Statistics

2022 Center for Statistics and the Social Sciences Travel Award, University of Washington

2022 Scholarship recipient, Institute for Foundations of Data Science
Supported by the NSF Transdisciplinary Research in Principles of Data Science (TRIPODS) program

2021 Proficiency Medal, Department of Mathematics and Statistics, IIT Kanpur
Awarded for the best academic performance among graduating students in each department

2017 Academic Excellence Award - Dr. Sangeeta Goel Memorial Award, IIT Kanpur
Awarded for the highest All India Rank (womens' category) in IIT-JEE

2017 All India Rank 365, Indian Institute of Technology - Joint Entrance Exam
Competitive college entrance exam with 1.5 million participants

2016 Certificate of Merit (Statewise Top 1%), National Standard Examination in Chemistry

2015 Fellow with All India Rank 212, Kishore Vigyan Protsahan Yojana, Department of Science and Technology
National Program of Fellowship in Basic Sciences, Government of India

2015 National Talent Search Examination Scholarship, National Council of Educational Research and Training
National Scholarship Program, Government of India

Talks and Workshops

Aug 2025	**Joint Statistical Meeting** Advances in Generative Models Session	*Nashville, TN*
Jul 2025	**Wasserstein Gradient Flows in Math and ML Workshop** Banff International Research Station *(invited attendee)*	*Banff, Canada*
Feb 2025	**Mathematics of Deep Learning Workshop** Institute for Foundations of Machine Learning	*Austin, TX*
Feb 2025	**UW Data Science Seminar** Seminar Series, AI@UW Seed Grant Awardees *(invited talk)*	*Seattle, WA*
Jan 2025	**Joint Mathematics Meetings** Mathematics of Adversarial, Interpretable, and Explainable AI *(invited talk)*	*Seattle, WA*
Nov 2024	**American Statistical Association Conference** Statistical Learning & Data Science Section	*Newport Beach, CA*
Oct 2024	**Society of Industrial and Applied Mathematics Conference** Mathematics of Data Science Section	*Atlanta, GA*
Oct 2023	**Society of Industrial and Applied Mathematics Conference** Pacific Northwest Section	*Bellingham, WA*
Mar 2023	**Bayes Comp** Session on MCMC diagnostics *(invited talk)*	*Levi, Finland*
Aug 2022	**Deep Learning Theory Workshop and Summer School** Simons Institute for the Theory of Computing	*Berkeley, CA*

Skills

Programming	Python, R, MATLAB, SQL
Leadership	Organizer, Normalizing flows working group (2022-23)
Tools & Framework	PyTorch, JAX, Tensorflow, Multi GPU, GitHub, LaTeX