Medha Agarwal

UNIVERSITY OF WASHINGTON

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Education

Fall 2021 - Current — **PhD in Statistics** — *Seattle, WA*
Department of Statistics, University of Washington
GPA: **3.8/4.0** | Machine learning and big data track

Fall 2017 - Spring 2021 — **B.S. in Mathematics and Scientific Computing** — *Kanpur, India*
Department of Mathematics and Statistics, IIT Kanpur
GPA: **8.9/10.0** | Minor: **English Literature**

Preprints

Oct 2021 — **A principled stopping rule for importance sampling** *[ArXiv]*
Medha Agarwal, Dootika Vats, Victor Elvira
Under review: Statistical Science

Oct 2021 — **Quasi-Newton Method for Acceleration of MM Algorithms** *[available on request]*
Medha Agarwal, Jason Xu (Duke University)
Under review: Journal of Royal Statistical Society: Series B

Sept 2020 — **Globally-centered autocovariances in MCMC** *[ArXiv]*
Medha Agarwal, Dootika Vats
Under review: Journal of Computational and Graphical Statistics

Mar 2019 — **Design and Development of Underwater vehicle: ANAHITA** *[ArXiv]*
Akash Jain, Manish Kumar, Ritwik Patibandha, ...
Accepted at: IEEE OES Autonomous Underwater Vehicle Symposium, 2018

Software

Nov 2020 — **R package** `quasiNewtonMM` *[GitHub devel version]*
Maintainer: Medha Agarwal, Co-developer: Prof. Jason Xu

Aug 2020 — **R package** `multichainACF` *[Webpage][GitHub devel version]*
Maintainer: Medha Agarwal, Co-developer: Prof. Dootika Vats

Research Experience

Fall 2020-Spring 2021 — **A Principled Stopping Rule for Importance Sampling** — *Kanpur, India*
Undergraduate Project, IIT Kanpur
Supervisors: Prof. Dootika Vats, Prof. Victor Elvira (University of Edinburgh)

- Estimated approximation-free multivariate effective sample size in importance sampling.
- Developed an asymptotically valid sequential stopping rule.

Summer 2020-Spring 2021 — **Acceleration of MM Algorithm using Quasi-Newton methods** — *Durham, NC*
[Remote] Research Scholar, Duke University
Supervisor: Prof. Jason Xu

- Proposed a quasi-Newton method for accelerating MM algorithms based on the Broyden's root finding method, that uses information from MM map for secant approximation.
- Proved the local and Q-superlinear convergence under reasonable assumptions.
- Developed a limited-memory version of the algorithm to tackle high-dimensional cases.

Spring 2020-Fall 2020 — **Globally-centered Autocovariances in Multiple Chain MCMC** — *Kanpur, India*
Undergraduate Project, IIT Kanpur
Supervisor: Prof. Dootika Vats

- Improved estimation of autocovariance function (ACF) for parallel MCMC implementation and developed an R package to construct the new ACF plots.
- Used the improved ACF estimator for estimating the limiting variance of ergodic average with significant theoretical and empirical improvement for slow-mixing Markov chains.
- Proved the strong consistency of proposed asymptotic variance under weak conditions and calculated its limiting bias and variance.

Summmer 2019 | **Bayesian Inference for Weibull Distribution** *Kanpur, India*
KVPY Project, IIT Kanpur
Supervisor: Prof. Debasis Kundu

- Motivated the use of Bayesian methods by highlighting the inadequacy of classical point estimation techniques for parameter estimation in the Weibull distribution.
- For improving computation efficiency, constructed a novel Gibbs sampler for approximate Bayesian inference, reducing the run time from 5 minutes to 30 seconds.

Fall 2017-Spring 2019 | **Autonomous Underwater Vehicle - ANAHITA** *Kanpur, India*
Research Project, Dean of Research and Development, IIT Kanpur
Supervisor: Prof. Mangal Kothari

- Worked in a team on building a custom object-detection and classification model through Deep Learning Algorithm (YOLO) using Tensorflow and Scikit-learn.
- Designed and developed the main hull, lifting mechanism, and grabbing mechanism of AUV.

Teaching Experience

Fall 2021 | **Teaching Assistant**
Elements of Statistical Methods (STAT 311)
Department of Statistics, University of Washington

Fall 2020 | **Teaching Assistant**
Statistical Simulations and Data Analysis (MTH 511A)
Department of Mathematics and Statistics, IIT Kanpur

Technical Skills

Programming	R, MATLAB, C/C++, Python
Tools/Framework	WinBUGS, Tensorflow, Scikit-learn, PyTorch, LaTeX
R Libraries	mcmcse, deplyr, reticulate, tidymodels
Coursework	Statistical Machine Learning, Statistical Inference, Time Series Analysis, Multivariate Analysis, Stochastic Processes, Statistical Simulations and Data Analysis, Bayesian Analysis, Probability Theory, Numerical Optimization, Real Analysis, Linear Algebra

Academic Achievements and Positions

2017 Awarded **Academic Excellence Award**-Dr. Sangeeta Goel Memorial Award at IIT Kanpur.
2017 Secured **All India Rank 365** among 172,000 candidates in IIT-JEE Advanced (entrance exam for IITs).
2017 Secured **All India Rank 682** among 1,500,000 candidates in IIT-JEE Mains (entrance exam for IITs).
2016 **Certificate of Merit (Statewise Top 1 %)** in National Standard Examination in Chemistry.
2015 Kishore Vigyan Protsahan Yojana fellowship recipient with **All India Rank 212**.
2015 Awarded National Talent search Examination scholarship by **Government of India**.

Conferences and Summer Schools (Attended)

Aug 10-14, 2020 | **14th International Conference in Monte Carlo & Quasi-Monte Carlo Methods in Scientific Computing**
Hosted by: University of Oxford, England

Jul 14-15, 2020 | **noRth 2020 - a virtual conference for R users** *(Scholarship recipient)*
Hosted by: University of Minnesota, United States

May 2018 | **Summer School for Women in Mathematics and Statistics**
Hosted by: International Center for Theoretical Sciences, India

Jul 2018 | **Machine Learning Summer School**
Hosted by: Association of Computing Activities, IIT Kanpur, India

Extracurriculars

Leadership	*Coordinator*, English Literary Society, IIT Kanpur. *Manager*, Undergraduate Academics Wing, Academic and Career Council, IIT Kanpur.
Positions	*Student Nominee*, Department Undergraduate Committee, IIT Kanpur. *Student Guide*, Counselling Services IIT Kanpur (2018-19).
Talks	Markov chain Monte Carlo, Special Interest Group in Machine Learning, IITK. Bayesian Statistics, Department of Mathematics and Statistics, IIT Kanpur.