

# Dootika Vats

## Curriculum Vitae

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## Academic Positions

- July '19 - **Assistant Professor**, Department of Mathematics and Statistics, IIT Kanpur.
- Mar 2017 - **NSF Postdoctoral Fellow**,  
Jul 2019 University of Warwick, England (mentor: Professor Gareth Roberts)  
University of California, Riverside (mentor: Professor James Flegal; May - July 2019).

## Education

- Feb 2017 **PhD, Statistics**, The University of Minnesota, Twin-Cities, USA.  
Advisor: Professor Galin Jones
- Nov 2016 **MS, Statistics**, The University of Minnesota, Twin-Cities, USA.
- May 2012 **MS, Statistics**, Rutgers University, New Brunswick, USA.
- May 2010 **BA(honors), Mathematics**, University of Delhi, Lady Shri Ram College, India.

## Research Interests

Markov chain Monte Carlo, Importance Sampling, Bayesian computation, variable selection, Bernoulli factories.

## Publications

- 2022 Agarwal, M.<sup>s</sup>, **Vats, D.**, Globally-centered autocovariances in MCMC, *Journal of Computational and Graphical Statistics*, to appear.
- 2021 **Vats, D.**, Flegal, J.M., Lugsail lag windows for estimating time-average covariance matrices, *Biometrika*, to appear.
- 2021 **Vats, D.**, Jones, G.L., Invited Discussion: “Rank-Normalization, Folding, and Localization: An Improved  $\hat{R}$  for Assessing Convergence of MCMC by Vehtari et. al.”, *Bayesian Analysis*, (link).
- 2021 **Vats, D.**, Gonçalves, F., Łatuszyński, K., Roberts, G. O., Efficient Bernoulli Factory MCMC for intractable posteriors, *Biometrika*, to appear.
- 2021 Liu, Y., **Vats, D.**, Flegal, J.M., Batch size selection for variance estimators in MCMC, *Methodology and Computing in Applied Probability*, to appear.
- 2021 **Vats, D.**, Knudson, C., Revisiting the Gelman-Rubin Diagnostic, *Statistical Science*, 36:518-529.
- 2020 Robertson, N., Flegal, J.M., **Vats, D.**, Jones, G.L., Assessing and visualizing simultaneous simulation error, *Journal of Computational and Graphical Statistics*, 30:324-334.
- 2020 **Vats, D.**, Jones, G.L., Comment: “Unbiased Markov chain Monte Carlo with couplings”, *Journal of the Royal Society Statistical Society, Series B*, (link).
- 2020 **Vats, D.**, Robertson, N., Flegal, J.M., Jones, G.L., Analyzing Markov Chain Monte Carlo Output, *WIREs Computational Statistics*, 12:e1501.

- 2019 **Vats, D.**, Flegal, J.M., Jones, G.L., Multivariate Output Analysis for Markov Chain Monte Carlo, *Biometrika*, 106:321-337.
- 2018 **Vats, D.**, Flegal, J.M., Jones, G.L., Strong Consistency of Multivariate Spectral Variance Estimators in Markov Chain Monte Carlo, *Bernoulli*, 24:1860-1909.
- 2017 **Vats, D.**, Geometric Ergodicity of Gibbs Samplers in Bayesian Penalized Regression Models, *Electronic Journal of Statistics*, 11:4033-4064.

### Preprints

- Submitted Agarwal, M.<sup>s</sup>, **Vats, D.**, Elvira, V., A principled stopping rule for importance sampling, arXiv.
- Submitted Zhou, Q., Yang, J., **Vats, D.**, Roberts, G. O., Rosenthal, J. S., A local MCMC algorithm for variable selection with dimension-free mixing time, arXiv.
- Submitted Agarwal, S.<sup>s</sup>, **Vats, D.**, Łatuszyński, K., Roberts, G. O., Optimal Scaling of MCMC Beyond Metropolis, arXiv.
- Submitted Gupta, K.<sup>s</sup>, **Vats, D.**, Chatterjee, C., Bayesian equation selection on sparse data for discovery of stochastic dynamical systems, arXiv.
- Submitted Gupta, K.<sup>s</sup>, **Vats, D.**, Estimating Monte Carlo variance from multiple Markov chains, arXiv.

### Book Chapters

- 2020 **Vats, D.** Flegal, J.M., Jones, G.L., Monte Carlo simulation: Are we there yet?, *Handbook of Computational Statistics and Data Science*, Wiley.

### Book Reviews

- 2019 **Vats, D.**, *Simulation and the Monte Carlo Method, 3rd ed. by Reuven Y. Rubinstein and Dirk P. Kroese*, Journal of the American Statistical Association, DOI.

### R Software

- Maintainer **SimTools**, **Vats, D.**, Flegal, J. M., Jones, G. L., Jalori, G..
- Maintainer **mcmcse**, Flegal, J.M., Hughes, J., **Vats, D.**, Dai, N..  
supported by Google Summer of Code 2015
- Contributor **stableGR**, Knudson, C., **Vats, D.**
- Contributor **multichainACF**, Agarwal, M., **Vats, D.**
- Contributor **qbld**, Agarwal, A., **Vats, D.**  
supported by Google Summer of Code 2020

### Sponsored Projects

- 2021-2024 **Principal Investigator**, SERB POWER Grant, INR 28,17,892, “Estimating high-dimensional covariance matrices in Markov chain Monte Carlo”.
- 2020-2021 **Principal Investigator**, SERB MATRICS Special call, INR 5,50,000, “Simulating with confidence: Accurate estimation in the study of COVID-19”.

### Invited Talks

- May 2022 Department of Statistical Science, Duke Univeristy, “*Revisiting Gelman-Rubin with Global Centering*”.

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<sup>s</sup>student author under my supervision

- April 2022 Conference on PDEs and Numerical Analysis, Online, “*Efficient Bernoulli factory MCMC for intractable posteriors*”.
- Feb 2022 Annual conference on Recent Advances in Statistical Theory and Applications, Online, “*Lugsail lag windows for estimating time-average covariance matrices*”.
- Jan 2022 Department of Decision Sciences, IIM Bangalore, Bangalore (virtual), “*Lugsail lag windows for estimating time-average covariance matrices*”.
- Nov 2021 Junior Bayes Beyond the Borders Webinar, (Blackwell-Rosenbluth Award Lecture), “*Lugsail lag windows for estimating time-average covariance matrices*”.
- Nov 2021 Department of Mathematical Sciences, University of Gothenburg/Chalmer’s University of Technology, Gothenburg, Sweden (Online), “*Revisiting the Gelman-Rubin diagnostic*”.
- Sept 2021 TIFR Centre for Applicable Mathematics, Online, “*A Gentle Introduction to Markov Chain Monte Carlo*”.
- Sept 2021 The Computer Science Society, St. Stephen’s College, Online, “*Statistics and Data Science: How big is the intersection?*”.
- Aug 2021 Department of Mathematics, IIT Guwahati, Guwahati (online), “*Lugsail lag windows for estimating time-average covariance matrices*”.
- Aug 2021 Joint Statistical Meeting, Seattle, USA (online), “*Efficient Bernoulli factory MCMC for intractable posteriors*”.
- June 2021 Department of Mathematics, Imperial College London, Coventry, UK (online), “*Efficient Bernoulli factory MCMC for intractable posteriors*”.
- June 2021 4th International Conference on Econometrics and Statistics, Hong Kong (Virtual), “*Lugsail lag windows for estimating time-average covariance matrices*”.
- May 2021 Department of Statistics, University of Warwick, Coventry, UK (online), “*The new BFFs in MCMC: Barker and Bernoulli*”.
- March 2021 Young Statisticians’ Meet: Data Science in action, ISI Kolkata (online), “*Visualizing the Quality of MCMC Samples*”.
- Aug 2020 Monte Carlo and Quasi Monte Carlo, Oxford, England (Moved online), “*Lugsail lag windows for estimating time-average covariance matrices*”.
- Jan 2020 The Fourth Paradigm: From Data to Discovery, Bhopal, India, “*Visualizing Uncertainty in Monte Carlo Experiments*”.
- Dec 2019 International Indian Statistical Association Conference 2019, Mumbai, India, “*Efficient Bernoulli Factory MCMC for Intractable Likelihood*”.
- Dec 2019 International Chinese Statistical Association Conference 2019, Hangzhou, China, “*Efficient Bernoulli Factory MCMC for Intractable Likelihood*”.
- Dec 2019 CMStatistics 2019, London, UK, “*Efficient Bernoulli Factory MCMC for Intractable Likelihood*”.
- Nov 2019 Director’s Colloquium, Indian Institute of Science Education and Research, Bhopal, India, “*Statistics and Data Science: How big is the intersection?*”.
- Oct 2019 Statistics I course, Indian Statistical Institute, Bangalore Center, Bengaluru, India, “*Monte Carlo Simulation*”.
- May 2019 Department of Statistical Science, University College London, London, UK, “*Revisiting the Gelman-Rubin diagnostic*”.
- Nov 2018 Indian Statistical Institute, Bangalore Center, Bengaluru, India, “*Multivariate Output Analysis for Markov Chain Monte Carlo*”.
- Oct 2018 Department of Mathematics, IISc Bangalore, Bengaluru, India, “*Lugsail Lag Windows and their Application to MCMC*”.

- Sep 2018 Department of Mathematics and Statistics, IIT Kanpur, Kanpur, India, "*Lugsail Lag Windows and their Application to MCMC*".
- Sep 2018 Department of Mathematics, IIT Delhi, Delhi, India, "*Lugsail Lag Windows and their Application to MCMC*".
- Sep 2018 Department of Mathematics, IIT Bombay, Mumbai, India, "*Lugsail Lag Windows and their Application to MCMC*".
- Aug 2018 (Topics contributed) Joint Statistical Meeting, Vancouver, Canada, "*MCMC Convergence Rate for High-Dimensional Bayesian Regression*".
- June 2018 Stochastic Processes and their Applications, Gothenburg, Sweden, "*MCMC Convergence Rate for High-Dimensional Bayesian Regression*".
- May 2018 International Indian Statistical Association Conference 2018, Gainesville, USA, "*MCMC Convergence Rate for High-Dimensional Bayesian Regression*".
- Sep 2018 Department of Mathematics and Statistics, University of Lancaster, Lancaster, UK, "*Lugsail Lag Windows and their Application to MCMC*".
- Feb 2018 Department of Statistics, University of Bath, Bath, UK, "*Multivariate Output Analysis for Markov Chain Monte Carlo*".
- Jan 2018 Department of Mathematics, Lady Shri Ram College, New Delhi, India, "*Integration is Old School*".
- Dec 2017 International Indian Statistical Association Conference 2017, Hyderabad, India, "*MCMC Convergence Rate for High-Dimensional Bayesian Regression*".
- March 2016 Department of Warwick, University of Warwick, Coventry, UK, "*Multivariate Output Analysis for Markov Chain Monte Carlo*".

## Awards

### Statistical Associations

- j-ISBA Blackwell-Rosenbluth Award, 2021
- JSM 2016 Student Paper Competition Winner, ASA's Section on Bayesian Statistical Science
- IISA 2015 Student Paper Competition Winner, International Indian Statistical Association

### University of Minnesota

- 2016 Director's Award, awarded for outstanding service to the School of Statistics
- Sum 2016 Graduate Research Partnership Program Fellowship
- 2016–2017 Louise T. Dossdall Fellowship, endowed fellowship for women in STEM
- 2015–2016 School of Statistics Alumni Fellowship, awarded to an outstanding student
- Fall 2015 Martin - Buehler Fellowship in Statistics, for travel support
- Spring 2014 Bernard W. Lindgren Graduate Student Teaching Award, for excellence in teaching
- Sum 2014 Lynn Lin Fellowship in Statistics, for promise in statistical consulting

## Teaching

### Indian Institute of Technology Kanpur

- MTH707a - Markov Chain Monte Carlo.
- MTH511a - Statistical Simulation and Data Analysis.

### University of Minnesota

- Spring 2015 Lead instructor, STAT 3011 - Introduction to Statistical Analysis.
- 2012–2015 Teaching Assistant, for *undergrad and grad statistics courses*.
- Sum 2013 Resource Instructor, College of Science and Engineering, New Grad Student Orientation.

## Rutgers University

- 2011–2012 Part Time Lecturer, *Calculus and pre-calculus*.  
Fall 2010 Grader, *Introduction to Mathematical Reasoning*.

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## Professional Service

### IIT Kanpur

- 2020-now Mess Warden, *Hall 6*.  
2020-now Senate Nominee, *SUGC*.  
2020-now Member, *Core Curriculum Committee*.

### Peer Review

- May 2022 - Associate Editor, *Sankhya Series B*.

Reviewer: *Biometrika*, *Computational and Mathematical Methods*, *Computational Statistics and Data Analysis*, *Electronic Journal of Statistics*, *Harvard Data Science Review*, *ICML*, *Journal of the American Statistical Association*, *Journal of Applied Probability*, *Journal of Computational and Graphical Statistics*, *Journal of Modern Power Systems and Clean Energy*, *Methodology and Computing in Applied Probability*, *NeurIPS*, *Neurocomputing*, *Sankhya*, *Scandinavian Journal of Statistics*, *Statistica Sinica*, *Statistical Analysis and Data Mining*, *Statistics and Computing*, *Statistics and Probability Letters*, *WIREs Computational Statistics*.

### Statistical Associations

- Jan 2021 - Elected Member of Program Committee-Asia Representative, *Caucus for Women in Statistics*.  
Summer Mentor, *R Project for Statistical Computing*, Google Summer of Code, 2020,2021.  
Jan 2019 Member of Review Panel, *American Statistical Association's Section on Bayesian Statistical Sciences' (SBSS) Student paper competition*.  
Jan 2018 Member of Review Panel, *American Statistical Association's Section on Bayesian Statistical Sciences' (SBSS) Student paper competition*.

### Workshops and Conferences

- Dec 2022 Scientific Program Committee member, *2022 IISA International Conference on Statistics*, Bangalore, India.  
July 2021 Program committee member, *useR! 2021*, Virtual.  
June 2021 Co-organizer, *Summer School for Women in Mathematics and Statistics*, ICTS (Virtual).  
Dec 2017 Scientific Program Committee member, *2017 IISA International Conference on Statistics*, Hyderabad, India.

### University of Warwick

- 2017-2019 Co-organizer, *Algorithms & Computationally Intensive Inference Seminar Series*.

### School of Statistics, University of Minnesota

- Sum 2016 Curriculum Co-organizer and Convener, *Teaching Assistant Training*.  
Spring 2016 Graduate Student Representative, *Search Committee for New Faculty*.  
Spring 2016 Organizer, *Student Talks Seminar Series*.