Name: Dr. Sourabh Bhattacharya

Designation: Associate Professor at Interdisciplinary Statistical Research Unit, Indian Statistical Institute (September 2015 till present).

Department: Interdisciplinary Statistical Research Unit

Institute: Indian Statistical Institute, Kolkata

E-mail: sourabh@isical.ac.in

Qualification:

- BSc in Statistics with first class honours, St Xavier's College, Calcutta University (1996–1999).
- MStat with first division (specialisation in Mathematical Statistics and Probability), Indian Statistical Institute (1999–2001).

- PhD in Statistics from Trinity College Dublin, Ireland (2001–2004).

- Post doctoral research associate at ISDS, Duke University (June, 2005 to June, 2006).
- Post doctoral research associate at University of Sheffield (June, 2006 to November, 2006).

THESIS

- Bhattacharya, S (2004). Importance Resampling MCMC: A methodology for cross-validation in inverse problems and its applications in model assessment.

ACADEMIC EXPERIENCES:

- Associate Professor at Interdisciplinary Statistical Research Unit, Indian Statistical Institute (September 2015 till present).

- Assistant Professor at Interdisciplinary Statistical Research Unit, Indian Statistical Institute (March 2007 till September 2015).

- Visiting scientist at Indian Statistical Institute (December, 2004 to May, 2005).

AWARD

- Microsoft Young Faculty Award, 2008.

RESEARCH INTERESTS

- Bayesian Statistics (theory, methods, applications, computations).

- Highly structured stochastic systems including spatio-temporal statistics.

- Computational methods in Bayesian Statistics (for example, Markov chain Monte Carlo) and application of high performance computation using parallel computing architecture to Bayesian computation.

- Model fitting and selection.

• Asymptotic theories.

• Stochastic differential equations.

• Pure mathematical topics such as Riemann hypothesis and their relations to Bayesian theory.

• Multiple hypotheses testing.

• Inverse problems.

• Bayesian nonparametrics.

• Bayesian machine learning.

• Big data analysis.

• Applications of Bayesian methodologies to challenging scientific issues, for example, palaeoclimatology, global warming, bio-informatics, human brain mapping, population genetics, gene-gene and gene-environment interactions, astronomy.

TEACHING EXPERIENCE

Teach full courses in ISI on regular basis, for example, Regression Techniques (M. Stat first year), Statistical Computing (M. Stat second year), Statistical Inference I (B. Stat third year), Statistical Inference I: Decision Theory (M. Stat first year), Asymptotic Inference (M. Stat second year), Statistical Inference for High-Dimensional Data (M. Stat second year), Resampling Techniques (M. Stat first year).

PHD STUDENTS WHO RECEIVED THEIR DEGREES

• Sabyasachi Mukhopadhyay (Year 2012, Thesis title: New Approaches to In2 ferential and Computational Aspects in a Flexible Bayesian Mixture Framework).

• Trisha Maitra (Year 2019, Thesis title: Asymptotic Theories of Inference and Model Selection in Systems of Stochastic Differential Equations).

• Durba Bhattacharya (Year 2019, Thesis title: Bayesian Nonparametric Approaches to Investigating Gene-Gene and Gene-Environment Interactions in Case-Control Studies).

• Noirrit Kiran Chandra (Year 2019, Thesis title: A Novel Bayesian NonMarginal Multiple Testing Procedure: Theory and Applications).

• Moumita Das (Year 2019, Thesis title: A Novel Nonstationary Bayesian Space-Time Model with a New Transdimensional Transformation Based Markov Chain Monte Carlo).

• Suman Guha (Year 2021, Thesis title: Some Theoretical and Methodological Contributions to the Dynamic Modeling of Discrete-Time Spatial Time Series Data).

• Debashis Chatterjee (Year 2022, Thesis title: A Brief Treatise on Bayesian Inverse Regresison.).

CURRENT PHD STUDENT

• Sucharita Roy (thesis completed in December 2020, awaiting submission. Thesis title: Infinite Series, Stochastic Processes, Function Optimization and the Bayesian Panacea).

M. STAT DISSERTATION STUDENTS

• Somak Dutta (2009-2010).

 • Kushal Kr. Dey (2012-2013).

 • Swarnadip Ghosh (2015-2016).

• Koulik Khamaru (2015-2016).

• Madhav Sankaranarayanan (2020-2021).

• Ritwik Bhaduri (2020-2021).

• Arindam Roychowdhury (2020-2021).

M. STAT PROJECT STUDENTS

• Sabyasachi Mukhopadhyay, Kaustav Adhikary, Ujjayan Paul, Supratik Kundu and 9 others (2007-2008).

• Prathyusha Burugupalli (2015–2016).

• Budhaditya Halder (2020-2021).

INTERNSHIP STUDENTS

• Harpreet Singh and Aniruddh Krishna (2008).

 • Urbi Dutta, Amandeep Chanda and Madhura Chakraborty (2019).

 • Arghyamalya Biswas (2021).

PAPERS PUBLISHED TILL THE YEAR OF JOINING ISI (TILL 2007)

• Bhattacharya, S. (2006). A Bayesian Semiparametric Model for Organism Based Environmental Reconstruction. Environmetrics, 17 (7), 763–776.

• Bhattacharya, S. (2007). A Methodology for Sensitivity Analysis in Inverse Problems – Application to a Palaeoclimate Problem. Environmetrics, 18 (6), 647–660.

 • Bhattacharya, S. (2007). A Simulation Approach to Bayesian Emulation of Complex Dynamic Computer Models. Bayesian Analysis, 2 (4), 783–816.

PAPERS PUBLISHED AFTER JOINING ISI (SINCE 2008)

 • Bhattacharya, S. (2008). Consistent Estimation of the Accuracy of Importance Sampling Using Regenerative Simulation. Statistics and Probability Letters, 78, 2522–2527.

• Bhattacharya, S (2008). Gibbs Sampling based Bayesian Analysis of Mixtures with Unknown Number of Components. Sankhya. Series B, 70, 133– 155.

• Bhattacharya, S. and SenGupta, A. (2009). Bayesian Analysis of Semiparametric Linear-Circular Models. Journal of Agricultural, Biological, and Environmental Statistics, 14, 33—65.

• Bhattacharya, S. and SenGupta, A. (2009). Bayesian Inference for Circular Distributions with Unknown Normalizing Constants. Journal of Statistical Planning and Inference, 139, 4179–4192.

• Mukhopadhyay, S., Bhattacharya, S. and Dihidar, K. (2011). On Bayesian "Central Clustering": Application to Landscape Classification of Western Ghats. Annals of Applied Statistics, 5, 1948–1977.

• Bhattacharya, S. and Maitra, R. (2011). A Nonstationary Nonparametric Bayesian Approach to Dynamically Modeling Effective Connectivity in Functional Magnetic Resonance Imaging Experiments. Annals of Applied Statistics, 5, 1183–1206.

• Mukhopadhyay, S., and Bhattacharya, S. (2012). Perfect Simulation for Mixtures with Known and Unknown Number of Components. Bayesian Analysis, 7 (3), 675–714.

• Mukhopadhyay, S., Roy, S. and Bhattacharya, S. (2012). Fast and Efficient Bayesian Semi-parametric Curve-fitting and Clustering in Massive Data. Sankhya B, 74 (1), 77–106.

• Majumdar, A., Bhattacharya, S., Basu, A., and Ghosh, S. (2013). A Novel Bayesian Semiparametric Algorithm for Inferring Population Structure and Adjusting for Case-Control Association Tests. Biometrics, 69 (1), 164–73.

• Bhattacharya, S. (2013). A Fully Bayesian Approach to Assessment of Model Adequacy in Inverse Problems. Statistical Methodology, 12, 71–83.

• Mukhopadhyay, S. and Bhattacharya, S. (2013). Cross-Validation Based Assessment of a New Bayesian Palaeoclimate Model. Environmetrics, 24, 4 550–568.

• Dutta, S., and Bhattacharya, S. (2014). Markov Chain Monte Carlo Based on Deterministic Transformations. Statistical Methodology, 16, 100–116.

• Ghosh, A., Mukhopadhyay, S., Roy, S,. and Bhattacharya, S. (2014). Bayesian Inference in Nonparametric Dynamic State-Space Models. Statistical Methodology, 21, 35–48.

PAPERS PUBLISHED SINCE 2015

• Chakrabarty, D., Biswas, M. And Bhattacharya, S (2015). Bayesian nonparametric estimation of Milky Way parameters using matrix-variate data, in a new Gaussian Process based method. Electronic Journal of Statistics, 9, 1378–1403.

• Banerjee, S., Basu, A., Bhattacharya, S., Bose, S., Chakrabarty, D., and Mukherjee, S. S. (2015). Minimum Distance Estimation of Milky Way Model Parameters and Related Inference. SIAM/ASA J. Uncertainty Quantification 3 (1), pp. 91–115.

• Maitra, T. and Bhattacharya, S. (2016). On Bayesian Asymptotics in Stochastic Differential Equations with Random Effects. Statistics and Probability Letters, Volume 103, Pages 148– 159, 2015.

• Maitra, T. and Bhattacharya, S. (2016). On Asymptotics Related to Classical Inference in Stochastic Differential Equations with Random Effects. Statistics and Probability Letters, 110, 278–288.

• Mazumder, S. And Bhattacharya, S. (2016). Bayesian Nonparametric Dynamic State Space Modeling with Circular Latent States. Journal of Statistical Theory and Practice, 10, 154–178.

• Dey, K. K. and Bhattacharya, S. (2016). On Geometric Ergodicity of Additive and Multiplicative Transformation Based Markov Chain Monte Carlo in High Dimensions. Brazilian Journal of Probability and Statistics, 30, 570– 613.

• Hazra, A., Bhattacharya, S., Banik, P. Bhattacharya, S. (2017). A Note on the Misuses of the Variance Test in Meteorological Studies. Meteorology and Atmospheric Physics. 129 (6), 645– 658.

• Mazumder, S. And Bhattacharya, S. (2017). Nonparametric Dynamic State Space Modeling of Observed Circular Time Series with Circular Latent States: A Bayesian Perspective. Journal of Statistical Theory and Practice, 11 (4), 693–718.

• Chatterjee, D. and Bhattacharya, S. (2017). A Statistical Perspective of Inverse and Inverse Regression Problems. RASHI, 2, 67–82.

• Dey, K. K. and Bhattacharya, S. (2017). A Brief Tutorial on Transformation Based Markov Chain Monte Carlo and Optimal Scaling of the Additive Transformation. Brazilian Journal of Probability and Statistics, 31, 569– 617.

• Bhattacharya, D. and Bhattacharya, S. (2018). A Bayesian Semiparametric Approach to Learning About Gene-Gene Interactions in Case-Control 5 Studies. Journal of Applied Statistics, 45 (16), 1–23, 2018.

• Maitra, T. and Bhattacharya, S. (2018). On Asymptotic Inference in Stochastic Differential Equations with Time-Varying Covariates. Canadian Journal of Statistics, 46 (4), 635–655.

• Hazra, A., Bhattacharya, S. and Banik, P. (2018). A Bayesian Zero-Inflated Exponential Distribution Model for the Analysis of Weekly Rainfall of the Eastern Plateau Region of India. Mausam 695773(1540):19–28.

• Das, M. and Bhattacharya, S. (2019). Transdimensional Transformation Based Markov Chain Monte Carlo. Brazilian Journal of Probability and Statistics, 33, 1, 87–138.

• Dey, K. K. and Bhattacharya, S. (2019). A Brief Review of Optimal Scaling of the Main MCMC Approaches and Optimal Scaling of Additive TMCMC Under Non-Regular Cases. Brazilian Journal of Probability and Statistics, 33, 2, 222-266.

• Chandra, N. K. and Bhattacharya, S. (2019). Non-marginal Decisions: A Novel Bayesian Multiple Testing Procedure. Electronic Journal of Statistics, 13 (1), 489–535.

• Chandra, N. K., Singh, R. and Bhattacharya, S. (2019). A Novel Bayesian Multiple Testing Approach to Deregulated miRNA Discovery Harnessing Positional Clustering. Biometrics, 75(1), 202-209.

• Maitra, T. and Bhattacharya, S. (2020). On Classical and Bayesian Asymptotics in Stochastic Differential Equations with Random Effects having Mixture Normal Distributions. Journal of Statiscal Planning and Inference, 208, 36–57

• Bhattacharya, D. and Bhattacharya, S. (2020). Effects of Gene-Environment and Gene-GeneInteractions in Case-Control Studies: A Novel Bayesian Semiparametric Approach. Brazilian Journal of Probability and Statistics, 34(1), 71-89.

• Chatterjee, D. Maitra, T and Bhattacharya, S. (2018). A Short Note on Almost Sure Convergence of Bayes Factors in the General Set-Up. The American Statistician, 72(1), 17-20.

• Roy, S. and Bhattacharya, S. (2020). Bayes Meets Riemann – Bayesian Characterization of Infinite Series with Application to Riemann Hypothesis. International Journal of Applied Mathematics and Statistics, 59(2), 81-128.

• Maitra, T. and Bhattacharya, S. (2020). On Classical and Bayesian Asymptotics in State Space Stochastic Differential Equations. Brazilian Journal of Probability and Statistics, 34(3), 629-657.

• Mukhopadhyay, S. and Bhattacharya, S. (2021). Bayesian MISE Convergence Rrates of Polya Urn Based Density Estimators: Asymptotic Comparisons and Choice of Prior Parameters. Statistics: A Journal of Theoretical and Applied Statistics, 55(1), 120–151.

• Chandra, N. K. and Bhattacharya, S. (2021). Asymptotic Theory of Dependent Bayesian Multiple Testing Procedures Under Possible Model Misspecification. Annals of the Institute of Statistical Mathematics, 73, 891–920.

• Mukhopadhyay, M. and Bhattacharya, S. (2022). Bayes Factor Asymptotics 6 for Variable Selection in the Gaussian Process Framework. Annals of the Institute of Statistical Mathematics, 74, 581–613.

PAPERS TO APPEAR

• Bhattacharya, S. (2021). Bayesian L´evy-Dynamic Spatio-Temporal Process: Towards Big Data Analysis. Journal of the Indian Statistical Association.

• Guha, S. and Bhattacharya, S. (2022). Bayesian Modeling of Discrete-Time Point-Referenced Spatio-Temporal Data. Journal of the Indian Institute of Science.

PUBLICATIONS IN CONFERENCE PROCEEDINGS

• Maitra, T. and Bhattacharya, S. (2019). Asymptotic Theory of Bayes Factor in Stochastic Differential Equations With Respect to Time and Individuals. Applied Research International Conferences, Oxford 2018, 33–52.

• Maitra T., Bhattacharya S. (2020) Asymptotic Theory of Bayes Factor in Stochastic Differential Equations with Increasing Number of Individuals. In: Bhattacharyya S., Kumar J., Ghoshal K. (eds) Mathematical Modeling and Computational Tools. ICACM 2018. Springer Proceedings in Mathematics & Statistics, vol 320. Springer, Singapore. https://doi.org/10.1007/978- 981-15-3615-1 32. PREPRINTS

• Maitra, T. and Bhattacharya, S. (2019). Asymptotic Theory of Bayes Factor in Stochastic Differential Equations: Part I. Arxiv preprint.

• Maitra, T. and Bhattacharya, S. (2019). Asymptotic Theory of Bayes Factor in Stochastic Differential Equations: Part II. Arxiv preprint.

• Guha, S. and Bhattacharya, S. (2019). Gaussian Random Functional Dynamic Spatio-TemporalModeling of Discrete-Time Spatial Time Series Data. Arxiv preprint.

• Das, M. and Bhattacharya, S. (2019). Nonstationary, Nonparametric, Nonseparable BayesianSpatio-Temporal Modeling using Kernel Convolution of Order Based Dependent Dirichlet Process. Arxiv preprint.

• Bhattacharya, D. and Bhattacharya, S. (2019). A Non-Gaussian, Nonparametric Structure for Gene-Gene and Gene-Environment Interactions in CaseControl Studies Based on Hierarchies of Dirichlet Processes. Arxiv preprint.

• Roy, S. and Bhattacharya, S. (2020). Function Optimization with Posterior Gaussian Derivative Process. Arxiv preprint.

• Roy, S. and Bhattacharya, S. (2020). Bayesian Characterizations of Properties of Stochastic Processes with Applications. Arxiv preprint.

• Roy, S. and Bhattacharya, S. (2020). Bayesian Appraisal of Random Series Convergence with Application to Climate Change. Arxiv

preprint.

• Chatterjee, D. and Bhattacharya, S. (2020). Posterior Convergence of Gaussian and General Stochastic Process Regression Under Possible Misspecifi7 cations. Arxiv preprint.

• Chatterjee, D. and Bhattacharya, S. (2020). Posterior Convergence of Nonparametric Binary and Poisson Regression Under Possible Misspecifications. Arxiv preprint.

• Chatterjee, D. and Bhattacharya, S. (2020). Posterior Consistency of Bayesian Inverse Regression and Inverse Reference Distributions. Arxiv preprint.

• Chatterjee, D. and Bhattacharya, S. (2020). Convergence of Pseudo-Bayes Factors in Forward and Inverse Regression Problems. Arxiv preprint.

• Chatterjee, D. and Bhattacharya, S. (2020). A Bayesian Multiple Testing Paradigm for Model Selection in Inverse Regression Problems. Arxiv preprint.

• Chatterjee, D. and Bhattacharya, S. (2020). How Ominous is the Future Global Warming Premonition? Arxiv preprint.

• Chandra, N. K. and Bhatatcharya, S. (2020). High-dimensional Asymptotic Theory of Bayesian Multiple Testing Procedures Under General Dependent Setup and Possible Misspecification. Arxiv preprint.

• Bhattacharya, S. (2021). IID Sampling from Intractable Distributions. Arxiv preprint.

• Bhattacharya, S. (2021). IID Sampling from Intractable Multimodal and Variable-Dimensional Distributions. Arxiv preprint.

• Bhattacharya, S. (2021). IID Sampling from Doubly Intractable Distributions. Arxiv preprint.

• Bhattacharya, S. (2022). IID Sampling from Posterior Dirichlet Process Mixtures. Arxiv preprint.

ACADEMIC ADMINISTRATION COMMITTEES

Served as a member of the following admission committees:

• M. Stat admission (2008).

• M. Tech CS admission (2008).

• B. Stat admission (2009).

• JRF Stat admission (2011-2019, 2021).

OTHER RESPONSIBILITIES

• Served as a technical editor of Sankhya, the Indian Journal of Statistics (2008–2010).

• Served as (and currently serving as) a member of Research Fellow Advisory Committee of Applied Statistics Division.