Sharmodeep Bhattacharyya

Department of Statistics, Oregon State University
239 Weniger Hall, Corvallis, OR 97331-4606
Citizenship: India

Mobile: (510) 316-5956
Email: bhattash@stat.oregonstate.edu
Website: http://science.oregonstate.edu/~bhattash

Current Position

Associate Professor,

Department of Statistics, Oregon State University,
Sep, 2021 - Present.

Assistant Professor,

Department of Statistics, Oregon State University,
Mar, 2015 - Aug, 2021.

Previous Position

Post-doctoral Researcher,

University of California, Berkeley,
Jan, 2014 - Feb, 2015.

Education

Ph.D. Statistics, University of California, Berkeley, Fall 2013.

Specialization: Designated Emphasis in Communication, Computation and Statistics.

M.Stat., Indian Statistical Institute, 2008.

Specialization: Mathematical Statistics and Probability.

B.Stat.(Hons.), Indian Statistical Institute, Kolkata, 2006.

Research Fields

Statistics on graphs and networks: Inference on statistics of networks, community detection in sparse networks, semi parametric modeling of networks.

High-dimensional data analysis: Development of methods for high-dimensional data analysis, high-dimensional time-series analysis, estimation of elliptical and shape-constrained densities in high-dimensions.

Statistical Application in Neuroscience: Analysis of multi-electrode array data using high-dimensional time-series and simultaneous equations models and network inference methods.

Statistical Application in Epidemiology: Analysis of long-range dispersal in plant epidemiology, analysis of COVID-19 disease related data.

Unsupervised learning especially clustering and manifold learning: Developing a theoretical framework for clustering using using level set, clustering on high-dimensional data, unified framework for clustering algorithm.

Multiple hypothesis testing: Control of FWER and FDR under correlated hypothesis.

Semiparametric and nonparametric statistical techniques and Time-series analysis.

Research

Refereed Publications

Hwang, N., Xu, J., Chatterjee, S., and **Bhattacharyya, S.**, 2023. On the estimation of the number of communities for sparse networks. *Journal of the American Statistical Association, just-accepted (2023): pp. 1-22.*

Hwang, N., Chatterjee, S., Di, Y. and **Bhattacharyya, S.**, 2023. Detection of Temporal Shifts in Semantics Using Local Graph Clustering. *Machine Learning and Knowledge Extraction, 5(1), pp.128-143.*

Senn, S., **Bhattacharyya, S.**, Presley, G., Taylor, A.E., Stanis, R., Pangell, K., Melendez, D. and Ford, J., 2023. The Community Structure of eDNA in the Los Angeles River Reveals an Altered Nitrogen Cycle at Impervious Sites. Diversity, 15(7), p.823.

Joshi, M., Di, Y., **Bhattacharyya, S.**, and Chatterjee, S., 2022. Changes over Time in Association Patterns between Estimated COVID-19 Case Fatality Rates and Demographic, Socioeconomic and Health Factors in the US States of Florida and New York. *COVID, 2(10), pp.1417-1434.*

Madlock-Brown, C., Wilkens, K., Weiskopf, N., Cesare, N., **Bhattacharyya, S.**, Riches, N.O., Espinoza, J., Dorr, D., Goetz, K., Phuong, J. and Sule, A., 2022. Clinical, social, and policy factors in COVID-19 cases and deaths: methodological considerations for feature selection and modeling in county-level analyses. *BMC public health, 22(1), p.747.*

Kumar, A., **Bhattacharyya, S.**, and Bouchard, K., 2022. Numerical characterization of support recovery in sparse regression with correlated design. *Communications in Statistics-Simulation and Computation, pp.1-15.*

Hwang, N., Chatterjee, S., Di, Y., and **Bhattacharyya, S.**, 2022. Observational study of the effect of the juvenile stay-at-home order on SARS-CoV-2 infection spread in Saline County, Arkansas. *Statistics and Public Policy.*

Senn, S., **Bhattacharyya, S.**, Presley, G., Taylor, A.E., Nash, B., Enke, R.A., Barnard-Kubow, K.B., Ford, J., Jasinski, B. and Badalova, Y., 2022. The functional biogeography of eDNA metacommunities in the post-fire landscape of the Angeles national forest. *Microorganisms, 10(6), p.1218.*

Ojwang, A.M.E., Ruiz, T.D., **Bhattacharyya, S.**, Chatterjee,S., Ojiambo, P., Gent, D., 2021. General Framework for Spatio-temporal Modeling of Epidemics with Multiple Epicenters: Application to an Aerially Dispersed Plant Pathogen. *Frontiers in Applied Mathematics and Statistics* (Editor's Choice Best Paper Award, 2021).

Hwang, N., Xu, J., Chatterjee, **S., Bhattacharyya, S.**, 2021. The Bethe Hessian and Information Theoretic Approaches for Online Change-Point Detection in Network Data. *Sankhya A (2021): 1-38.* (Invited paper in Sankhya Series A for Special Issue on Networks).

Li, T., Lei, L., **Bhattacharyya, S.**, Van den Berge, K., Sarkar, P., Bickel, P. J., and Levina, E., 2020. Hierarchical community detection by recursive bi-partitioning. *Journal of the American Statistical Association. 2020 Oct 8:1-39.*

Bhattacharyya, S., and Chatterjee, S., 2020. Consistent Recovery of Communities from Sparse Multi-relational Networks: A Scalable Algorithm with Optimal Recovery Conditions. *Complex Networks XI (pp. 92-103). Springer, Cham.*

Ruiz, T., Balasubhramanian, M., Bouchard, K. and **Bhattacharyya, S.**, 2020. Sparse and Low-bias Estimation of High Dimensional Vector Autoregressive Models. *Proceedings of 2nd Learning For Dynamics & Control (L4DC) Conference.*

Balasubramanian, M., Ruiz, T., Cook, B., **Bhattacharyya, S.**, Shrivastava, A. and Bouchard, K., 2020. Scaling of Union of Intersections for Inference of Granger Causal Networks from Observational Data. *Proceedings of 34th IEEE International Parallel and Distributed Processing Symposium.*

Gent, D. H., **Bhattacharyya, S.**, and Ruiz, T., 2019. Prediction of Spread and Regional Development of Hop Powdery Mildew: A Network Analysis. *Phytopathology, 109(8), 1392-1403.*

Bouchard, K., Sachdeva, P., **Bhattacharya, S.**, Balasubramanian, M. and Ubaru, S., 2019. Union of Intersections (UoI) for interpretable data driven discovery and prediction in neuroscience. *Cosyne Abstracts 2019, Lisbon, PT.*

Sachdeva, P. S., **Bhattacharyya, S.**, and Bouchard, K. E., 2019. Sparse, Predictive, and Interpretable Functional Connectomics with UoI Lasso. *41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) (pp. 1965-1968). IEEE.*

Bouchard, K., Bujan, A., Roosta-Khorasani, F., Ubaru, S., Prabhat, M., Snijders, A., Mao, J.H., Chang, E., Mahoney, M.W. and **Bhattacharya, S.**, 2017. Union of Intersections (UoI) for Interpretable Data Driven Discovery and Prediction. In *Advances in Neural Information Processing Systems (pp. 1078-1086).*

Bhattacharyya, S. and Bickel, P.J., 2016. Spectral clustering and block models: A review and a new algorithm. In *Statistical Analysis for High-Dimensional Data (pp. 67-90). Springer, Cham.*

Bhattacharyya, S. and Bickel, P.J., 2015. Subsampling bootstrap of count features of networks. *Annals of Statistics, 43(6), pp.2384-2411.*

Underline indicates graduate student

In Review

Sachdeva, P., Bak, J.H., Livezey, J., Kirst, C., Frank, L., **Bhattacharyya, S.**, and Bouchard, K.E. 2023. Resolving Non-identifiability Mitigates Biases in Models of Neural Tuning and Functional Coupling. *(Submitted in PLOS Comp Bio).*

Underline indicates graduate student

Non-refereed Publications

Sachdeva, P., Bak, J.H., Livezey, J., Kirst, C., Frank, L., **Bhattacharyya, S.**, and Bouchard, K.E. 2023. Resolving Non-identifiability Mitigates Biases in Models of Neural Tuning and Functional Coupling. *(bioRxiv, pp.2023-07).*

Ruiz, T.D., **Bhattacharyya, S.**, and Emerson, S.C., 2023. Sparse estimation of parameter support sets for generalized vector autoregressions by resampling and model aggregation. *arXiv preprint arXiv:2307.09684.*

Chatterjee, S., Chatterjee, S., Mukherjee, S.S., Nath, A. and **Bhattacharyya, S.**. 2022. Concentration inequalities for correlated network-valued processes with applications to community estimation and changepoint analysis. *arXiv preprint arXiv:2208.01365.*

Hwang N., Chatterjee, S., Di, Y., and **Bhattacharyya, S.**, 2020. Estimating the treatment effect of the juvenile stay-at-home order on SARS-CoV-2 infection spread in Saline County, Arkansas. *arXiv preprint arXiv:2009.08691. 2020 Sep 18.*

Bhattacharyya S., Chatterjee S., Mukherjee S.S., 2020. Consistent detection and optimal localization of all detectable change points in piecewise stationary arbitrarily sparse network-sequences. *arXiv preprint arXiv:2009.02112. 2020 Sep 4.*

Bhattacharyya, S., and Chatterjee, S., 2020. General Community Detection with Optimal Recovery Conditions for Multi-relational Sparse Networks with Dependent Layers. *arXiv preprint arXiv:2004.03480.*

Ruiz, T., Balasubramanian, M., Bouchard, K. E., and **Bhattacharyya, S.**, 2019. Sparse, Low-bias, and Scalable Estimation of High Dimensional Vector Autoregressive Models via Union of Intersections. *arXiv preprint arXiv:1908.11464.*

Li, T., **Bhattacharyya, S.**, Sarkar, P., Bickel, P. J., and Levina, E., 2018. Hierarchical community detection by recursive bi-partitioning. *arXiv preprint arXiv:1810.01509.*

Balasubramanian, M., Ruiz, T., Cook, B., **Bhattacharyya, S.**, Shrivastava, A. and Bouchard, K., 2018. Optimizing the Union of Intersections LASSO (UoILASSO) and Vector Autoregressive (UoIVAR) Algorithms for Improved Statistical Estimation at Scale. *arXiv preprint arXiv:1808.06992.*

Bhattacharyya, S., and Chatterjee, S., 2018. Spectral clustering for multiple sparse networks: I. *arXiv preprint arXiv:1805.10594.*

Bhattacharyya, S. and Bickel, P.J., 2014. Adaptive estimation in elliptical distributions with extensions to high dimensions. *Preprint.*

Bhattacharyya, S. and Bickel, P.J., 2014. Community detection in networks using graph distance. *arXiv preprint arXiv:1401.3915.*

Bhattacharyya, S. and Bickel, P.J., 2011. A naive approach to finding number of clusters in partitioning clustering. *Preprint.*

Underline indicates graduate student

Non-Refereed Proceedings Articles

Niyaghi, F., **Bhattacharyya, S.** and Emerson, S., 2017. Variable Selection Using Intersection and Average of Random Forests. In *JSM 2017 Proceedings.*

Bhattacharyya, S., Richards, J.W., Rice, J., Starr, D.L., Butler, N.R. and Bloom, J.S., 2012. Identification of outliers through clustering and semi-supervised learning for all sky surveys. In *Statistical Challenges in Modern Astronomy V (pp. 483-485). Springer, New York, NY.*

Underline indicates graduate student

Working Papers

Generalized VAR: Union of Intersections method for Generalized Vector autoregressive models, (With Dr. Sarah Emerson and Trevor Ruiz).

Online changepoint detection in networks, (With Dr. Shirshendu Chatterjee, Neil Hwang and Jiarui Xu).

Epidemiological network for downey mildew spread in hops plant, (With Dr. David Gent).

Changepoint detection in sequence of network data, (With Dr. Shirshendu Chatterjee and Dr. Soumendu Mukherjee).

Theoretical Analysis of Clustering: Attempting to give a theoretical foundation to clustering by linking metric and density-based methods and thus developing better clustering algorithms for both low and high-dimensional datasets. (With Prof. Peter Bickel)

Underline indicates graduate student

Unpublished Papers

Analysis of Arsenic Data in Gangetic Delta, with M. A. Hussain, R. Guhaniyogi, U. Pal (2006).

A Study of Optimal Partitioning Algorithms in Cluster Analysis (Master's Thesis), under Prof. Probal Chaudhuri (2008)

Grants

USDA NIFA grant: US-UK Collab: Long Distance Dispersal and Disease Spread Under Increased Ecological Complexity, Total Amount: $3,000,000, Time: 2022-2026, (PI: Chris Mundt, OSU).

USDA SCRI grant: Enhancing Supply Chain Sustainability and Global Competitiveness for Pacific Northwest Hops, Total Amount: $4,853,908, Time: 2021-2025, (PI: Doug Walsh, WSU).

NSF: CC Team: Oregon Big Data Research and Education Team*, Total Amount: $1,400,000, Time: 2020-2023, (PI: Brett Tyler, OSU).

Workshop in Banff International Research Station on *New Directions in Statistical Inference on Networks and Graphs*, Time: Sep 19-24, 2021, (PI: Sharmodeep Bhattacharyya, OSU and co-PI: Elizaveta Levina, UMich, co-PI: Carey Priebe, JHU, co-PI: Tianxi Li, UVirginia).

DARPA grant: Predictive and Interpretive Analysis of Neural Time-Series Data, Amount: $50,000, Time: 2017-2018, (PI: Kenneth Kosik, UCSB and co-PI: Kristofer Bouchard, LBNL)

Oregon BEST grant: Integrated Decision Support for Irrigation Management, Amount: $20,000, Time: 2016-2018, (PI: Clinton Shock, OSU)

USDA grant: A production system for high value crops at risk from downy mildew: Integrating detection, breeding, extension, and education, Amount: $150,000, Time: 2016-2019, (PI: Mary Hausbeck, MSU)

UC Davis grant: Network Characteristics and Modeling of Powdery Mildew Spread: Foundations for Area-Wide IPM, Amount: $20,000, Time: 2016-2017, (PI: David Gent, USDA and OSU)

The Automated Detection of R Cor Bor Stars - Spectroscopic Confirmation by Adam Miller, Joseph W. Richards, Sharmodeep Bhattacharyya, Dan L. Starr and Joshua S. Bloom. Accepted in *National Optical Astronomy Observatory.*

Internship

Summer 2010: Quantitative Marketing Research Group, Google Inc., Mountain View, CA.
Project: *Model-based Advertiser Diagnostics: Local interpretation of Black-Box Models.*

Talks

Invited Talks in Conferences and Workshops

Invited Talk, Latin American Conference on Probability and Statistics, Sao Paulo, Brazil, July 2023.
Title: Dependence Structures in Network Data

Invited Talk, International Indian Statistical Association Conference 2023, Golden CO, June 2023.
Title: Estimation of Number of Communities for Sparse Networks

Invited Talk, Statistics in Big Data Era Workshop, Simons Institute, Berkeley CA, June 2022.
Title: Dependence Structures in Network Data

Invited Talk, International Chinese Statistical Association Conference, online, September 2021.
Title: Change Point Detection in Dependent Networks

Invited Talk, Joint Statistical Meetings 2021, online, August 2021.
Title: Change Point Detection in Dependent Networks

Invited Talk, LRMNA Workshop at Networks 2021 conference, online, June 2021.
Title: Change Point Detection in Network Sequences

Invited Topic Contributed Talk, Joint Statistical Meetings 2020, online, August 2020.
Title: Online change point detection in network sequences.

Invited Talk, International Indian Statistical Association Conference 2019, Mumbai, India, December 2019.
Title: On the CUSUM change point estimator for network data

Invited Talk, International Workshop on Network Data Analysis, Changchun, China, October, 2018.
Title: Spectral Clustering for Multiple Sparse Networks

Invited Talk, Statistics of Network Analysis Workshop, The Alan Turing Institute, London, UK, May 2018.
Title: Dynamic community detection for multiple networks.

Invited Talk, International Indian Statistical Association Conference 2017, Hyderabad, India, December 2017.
Title: Dynamic community detection for multiple networks.

Invited Topic Contributed Talk, Joint Statistical Meetings 2017, Baltimore, August 2017.
Title: Spectral clustering for dynamic block models.

Invited Talk, CMStatistics, Seville, Spain, December 2016.
Title: Spectral clustering for dynamic stochastic block models.

Invited Talk, International Indian Statistical Association Conference 2016, Corvallis OR, August 2016.
Title: Regularization in nonparametric latent variable network model inference

Invited Talk, Joint Statistical Meetings 2016, Chicago, August 2016.
Title: Union of Intersections (UoI) method for bootstrap-based interpretable discovery

Invited Talk, Theoretical Foundations of Statistical Network Analysis Programme at INI for Mathematical Sciences, Cambridge, UK, June 2016.
Title: Spectral clustering for dynamic stochastic block model.

Invited Talk, International Indian Statistical Association Conference 2015, Pune, India, December 2015.
Title: Statistical inference of networks with vertex and edge covariates

Invited Talk, Joint Statistical Meetings 2015, Seattle, August 2015.
Title: Inference in nonparametric latent variable network models.

Invited Talk, Theory of Big Data Workshop, UCL, UK, January, 2015.
Title: Estimating latent variable densities for exchangeable network models.

Invited Talk, International Indian Statistical Association Conference 2014, Riverside CA, July 2014.
Title: Community detection in networks using graph distance.

Invited Talk, Second Conference of International Society of Non-Parametric Statistics, Spain, June 2014.
Title: Estimating latent variable densities for exchangeable network models.

Invited Talk, Networks with Community Structure Workshop, EURANDOM, Netherlands, January 2014.
Title: Community detection in networks using graph distance.

Invited Talk, International Conference on Biodiversity, Indian Statistical Institute, Kolkata, November 2007.
Title: Spatial modeling of groundwater arsenic data in Gangetic delta.

Invited Talks in Department Seminars

Invited Talk, ISRU Seminar, Indian Statistical Institute, Kolkata, India, December, 2018.
Title: Hierarchical community detection by recursive bi-partitioning

Invited Talk, Statistics Department Seminar, UC Riverside, March 2018.
Title: Spectral Clustering for Multiple Sparse Networks

Invited Talk, Probability Seminar, Oregon State University, May 2017.
Title: Spectral Clustering for Dynamic Block Models

Invited Talk, Applied Mathematics and Computation Seminar, Oregon State University, January 2017.
Title: Spectral Clustering for Dynamic Block Models

Invited Talk, Johns Hopkins University, Applied Math Seminar, December 2016.
Title: Spectral Clustering for Dynamic Stochastic Block Model

Invited Talk, Statistics Department Seminar, UCLA, November 2015.
Title: Estimating latent variable densities for exchangeable network models.

Invited Talk, Statistics Department Seminar, University of Michigan, Ann Arbor, October 2014.
Title: Estimating latent variable densities for exchangeable network models.

Invited Talk, Statistics Department Seminar, Oregon State University, March 2014.
Title: Estimating latent variable densities for exchangeable network models.

Other Presentations

Competitive Accepted Talk, Data Science Innovation Lab 2016: Mobile Health, USC 2016.

Competitive Accepted Talk, Challenges in Computational Neuroscience workshop in SAMSI, 2015.

Competitive Accepted Talk, IMS New Researchers Conference, Harvard University, August, 2014.

Contributed Talk, Joint Statistical Meeting, San Diego, August 2012.

Contributed Talk, World Congress of Probability and Statistics, Istanbul, June 2012.

Contributed Talk, Statistical Challenges in Modern Astronomy V, Penn State University, June 13-17, 2011.

Competitive Accepted Talk, Complex Networks Transition Workshop, SAMSI, June 6-7, 2011.

Contributed Talk, Sixth International Triennial Kolkata Symposium on Probability & Statistics, University of Calcutta, December 29-31, 2006.

Service to the Profession

Reviewer

Member: **NSF** Statistics Grant Reviewer Panel, 2018, **NSF** Applied Mathematics Grant Reviewer Panel, 2021.

Reviewer for Statistics journal: Journal of American Statistical Association (more than 10 reviews), Annals of Statistics (more than 10 reviews), Biometrika (3 reviews), Journal of Machine Learning Research (7 reviews), Journal of Multivariate Analysis (1 Review), Sankhya Series A (1 review), Canadian Journal of Statistics (1 Review), Statistical Sinica (1 Review), Journal of Mathematics and Music (1 Review).

Reviewer for ML Conference: ICML 2015, 2020, NeurIPS 2015-23, AISTATS 2016.

Conference/Workshop Organization

Workshop: New Directions in Statistical Inference on Networks and Graphs; Location: Banff International Research Station (BIRS), Canada; Time: 09/21/2021-09/24/2021. (Canceled due to COVID-19 restrictions)
Role: Lead Organizer. The workshop proposal was selected through a competitive process among 100+ proposals for workshops on Mathematical and Statistical topics.

Session Organization in Conference

Invited Session Organizer, International Indian Statistical Association Conference 2023, Golden CO, June 2023.

Invited Session Organizer, International Indian Statistical Association Conference 2022, Bengaluru, India, December 2022.

Invited Session Organizer and Chair, Joint Statistical Meetings, Washington DC, August, 2022.

Invited Session Organizer and Chair, Joint Statistical Meetings, Denver, August, 2019.

Topic-contributed Session Organizer, Joint Statistical Meetings, Baltimore, August, 2019.

Invited Session Organizer and Chair, International Indian Statistical Association Conference 2016, Corvallis OR, August 2016.

Teaching

Instructor at Oregon State University

ST 412/512, Spring 2016, Winter 2017, Spring 2019, Winter 2022: Methods of Data Analysis II

ST 538, Spring 2018, 2019, 2020: Statistical Methods for Large and Complex Datasets (Online)

ST 552, Winter 2017, 2018, 2020: Statistical Methods II

ST 557, Fall 2017: Applied Multivariate Analysis

ST 562, Winter 2016: Theory of Statistics II

ST 566, Winter 2022: Time Series Analytics (Online)

ST 595, Fall 2018, Fall, Spring and Winter 2019, Spring and Winter 2020: Capstone Project (Online)

ST 599, Spring 2015: Modern Statistical Methods for Large and Complex Data Sets.

Instructor at University of California, Berkeley

Stat 131A, Fall 2012: Statistical Inference for Biological Scientists

TA in Graduate Courses at University of California, Berkeley

Stat 210A, Fall 2009: Theoretical Statistics

Stat 210B, Spring 2012: Theoretical Statistics

TA in Undergraduate Courses at University of California, Berkeley

Stat 151B, Spring 2010: Modern Applied Statistics and Machine Learning.

Stat 20, Fall 2010: Introductory Statistics

Honors & Awards

Awards

Bay Area ASA travel grant award for JSM, 2012.

NSF travel grant award for World Congress in Probability and Statistics, Instanbul, 2012.

ISIAA Mrs. M.R. Iyer Gold Medal for Outstanding Achievement, M.Stat, Indian Statistical Institute, Kolkata, 2008.

Awards for excellent academic performance in eight semesters, Indian Statistical Institute, Kolkata, 2004–2008.

Scholarships

D.V. Gokhale Grant in Statistics, IIE, 2008-2009.

National Talent Search Examination Scholarship, NCERT, Govt. of India, 2001.

Jagadis Bose National Science Talent Search Scholarship, 2003.

Computer Skills

C, Fortran, Python, Matlab, Mathematica, R, SAS, SQL, LaTeX.

References

Peter J. Bickel
Professor Emeritus of Statistics
University of California, Berkeley
bickel@stat.berkeley.edu

Sastry Pantula
Dean, College of Natural Sciences
California State University, San Bernandino
sastry.pantula@csusb.edu

Elizaveta Levina
Chair and Professor, Department of Statistics
University of Michigan, Ann Arbor
elevina@umich.edu

Last updated: October 17, 2023