

Lu Zhang

Curriculum Vitae

Division of Biostatistics
Department of Population and Public Health Sciences
University of Southern California
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Employment

- 2022–current **Assistant Professor**, *University of Southern California, USA.*
2020–2022 **Postdoctoral Researcher**, *Columbia University, USA.*
Supervisor: Bob Carpenter, Andrew Gelman

Education

- 2014–2020 **Ph.D. in Biostatistics**, *University of California, Los Angeles, USA.*
Advisor: Sudipto Banerjee
2010–2014 **B.S. in Mathematics and Applied Mathematics**, *Fudan University, China.*

Research Interests

Spatial analysis, Bayesian statistics, high dimensional inference, computational statistics and open-source software development

Papers (* co-first author, † students mentored by me)

Publications and Accepted Manuscripts

1. Shengjie Liu[†], **Lu Zhang**. Deep Feature Gaussian Processes for Single-Scene Aerosol Optical Depth Reconstruction. (2024) *Accepted by IEEE Geoscience and Remote Sensing Letters*
2. **Lu Zhang***, Wenpin Tang*, Sudipto Banerjee, Fixed-Domain Asymptotics Under Vecchia's Approximation of Spatial Process Likelihoods (2023). *Statistica Sinica*. http://www3.stat.sinica.edu.tw/ss_newpaper/SS-2021-0428_na.pdf
3. **Lu Zhang**, Bob Carpenter, Andrew Gelman, Aki Vehtari (2022). Pathfinder: Parallel quasi-Newton variational inference. *Journal of Machine Learning Research*. . <https://www.jmlr.org/papers/volume23/21-0889/21-0889.pdf>
4. **Lu Zhang** (2022). Applications of Conjugate Gradient in Bayesian computation. *Wiley StatsRef-Statistics Reference Online*. <https://doi.org/10.1002/9781118445112.stat08411>
5. Wenpin Tang*, **Lu Zhang***, Sudipto Banerjee (2021). On identifiability and consistency of the nugget in Gaussian spatial process models. *Journal of the Royal Statistical Society Series B, (Statistical Methodology)*, <https://rss.onlinelibrary.wiley.com/doi/10.1111/rssb.12472>

6. **Lu Zhang**, Sudipto Banerjee, (2021) Spatial Factor Modeling: A Bayesian Matrix-Normal Approach for Misaligned Data. *Biometrics*, 78(2), 560-573.. <http://doi.org/10.1111/biom.13452>
7. **Lu Zhang**, Sudipto Banerjee, Andrew O. Finley (2021). High-dimensional multivariate geostatistics: A Bayesian matrix-normal approach. *Environmetrics*, 32(4), e2675. **Selected for the 2021 Wiley-TIES Best Paper Award** <https://onlinelibrary.wiley.com/doi/10.1002/env.2675>
8. Gregory L. Watson, Di Xiong, **Lu Zhang**, Joseph A. Zoller, John Shamshoian, Phillip Sundin, Teresa Bufford, Anne W. Rimoian, Marc A. Suchard, Christina M. Ramirez (2021). Pandemic velocity: forecasting COVID-19 in the US with a machine learning & Bayesian time series compartmental model. *PLOS Computational Biology*, 17(3), e1008837.
9. Di Xiong*, **Lu Zhang***, Gregory L. Watson, Phillip Sundin, Teresa Bufford, Joseph A. Zoller, John Shamshoian, Marc A. Suchard, Christina M. Ramirez, (2020). Pseudo-likelihood based logistic regression for estimating COVID-19 infection and case fatality rates by gender, race, and age in California. *Epidemics*, 33, 100418. <https://www.sciencedirect.com/science/article/pii/S1755436520300396>
10. **Lu Zhang**, Abhirup Datta, Sudipto Banerjee. (2019). Practical Bayesian modeling and inference for massive spatial data sets on modest computing environments. *Statistical Analysis and Data Mining: The ASA Data Science Journal*, 12(3), 197-209. <https://onlinelibrary.wiley.com/doi/full/10.1002/sam.11413>

Preprints

11. **Lu Zhang**, Wenpin Tang, Sudipto Banerjee. Bayesian Geostatistics Using Predictive Stacking, <https://arxiv.org/abs/2304.12414>
12. Shane Sparkes[†], **Lu Zhang**. Properties and Deviations of Random Sums of Densely Dependent Random Variables, <https://arxiv.org/abs/2310.11554>
13. **Lu Zhang**, Andrew Finley, Arne Nothdurft, Sudipto Banerjee. Bayesian Modeling of Incompatible Spatial Data: A Case Study Involving Post-Adrian Storm Forest Damage Assessment, <https://arxiv.org/abs/2311.11256>
14. Shane Sparkes[†], Erika Garcia, **Lu Zhang**. The functional average treatment effect, <https://arxiv.org/abs/2312.00219>
15. Soumyakanti Pan, **Lu Zhang**, Jonathan R. Bradley, Sudipto Banerjee. Bayesian Inference for Spatial-temporal Non-Gaussian Data Using Predictive Stacking, <https://arxiv.org/abs/2406.04655>
16. Måns Magnusson, Jakob Torgander, Paul-Christian Bürkner, **Lu Zhang**, Bob Carpenter, Aki Vehtari. posteriordb: Testing, Benchmarking and Developing Bayesian Inference Algorithms, <https://arxiv.org/abs/2407.04967>

Packages

1. **Lu Zhang** and Jun Yin (2018). *phase1PRMD: Personalized Repeated Measurement Design for Phase I Clinical Trials*. R package version 1.0.2. CRAN: <https://cran.r-project.org/web/packages/phase1PRMD/index.html>

2. Xiang Chen, **Lu Zhang**, Sudipto Banerjee (2018). *JAMAJniLite: A JAVA package providing a java interface for lapack and blas libraries and using the classes defined by JAMA Package* Github: <https://github.com/JAMAJni/JAMAJniLite>
3. **Lu Zhang**, LiZhen Nie, Sudipto Banerjee (2017). *JALAJni: A JAVA package providing a java interface for lapack and blas library* Github: <https://github.com/JaLALAJni/JaLALAJni>

Grants

03/2023-03/2024 **Principal Investigator**, *Assessing Particulate Matter Exposures Based On Multi-Source Satellite Data Using Scalable Gaussian Process Models*, Southern California Environmental Health Sciences Center (P30ES007048) Pilot Projects Program. Total Direct Costs \$47,500

Teaching Experience

Instructor at USC

Summer 2024 PM 511a: **Data Analysis (a)**

Fall 2023 PM 569: **Spatial Statistics**

Graduate Teaching Assistant at UCLA

2015-2020 Biostat 100A: **Introduction to Biostatistics**

(Summer 2015, Fall 2015, Spring 2016, Summer 2017, Fall 2019)

2016-2020 Biostat 100B: **Introduction to Biostatistics**

(Winter 2016, Winter 2017, Winter 2018, Winter 2020)

Fall 2016 Biostat 200A: **Basic Biostatistics**

Spring 2017 Biostat 411: **Analysis of Correlated Data**

Fall 2017 Biostat 255A: **Advanced Topics & Probability in Biostatistics**

Winter 2017 Biostat 255B: **Advanced Topics & Probability in Biostatistics**

Spring 2018 Biostat 257: **Statistical Computing**

Spring 2019 Biostat 241: **Spatial modeling**

Fall 2019 Public Health 200: **Foundations in Public Health**

Spring 2020 Biostat 214: **Finite Population Sampling**

Working Experience

Jun. - Sep. **Internship in Biostatistics**, *Mayo Clinic*, Rochester, Minnesota USA,

2018 Sponsor: Yin Jun, Ph.D.

- Statistical consultation to Physicians
- Experimental design (clinical trial design)
- Software development (develop R package)

Selected Awards

2020 **Dean's Outstanding Student Award in Biostatistics**, Department of Biostatistics, UCLA

- 2018 **Celia G. and Joseph G. Blann Fellowship**, Department of Biostatistics, UCLA
2016 **Graduate Summer Research Mentorship**, Department of Biostatistics, UCLA

Talks

Invited

- July. 2024 **Pathfinder and the Geometry of Bayesian Inference.**
ISBA, Venice, Italy
- May. 2024 **Bayesian Geostatistics Using Predictive Stacking.**
NESS, Storrs, Connecticut, USA
- May. 2023 **Pathfinder: A Parallel Quasi-Newton Algorithm for Reaching Regions of High Probability Mass.**
IRSA's 2023 conference, Institute for Research in Statistics and its Applications at University of Minnesota, Minneapolis, MN, USA
- Apr. 2023 **Bayesian inference for high-dimensional latent spatial model: Why we should and how to avoid random walk in MCMC.**
DMS Colloquium, Department of Mathematics and Statistics at Auburn University, Auburn, AL, USA
- Mar. 2023 **Pathfinder: A Parallel Quasi-Newton Algorithm for Reaching Regions of High Probability Mass.**
Bayes Comp 2023, Levi, Finland
- Jan. 2023 **Bayesian inference for high-dimensional latent spatial model: Why we should and how to avoid random walk in MCMC.**
Purdue Research Colloquium, Statistics at Purdue University, West Lafayette, IN, USA
- Sep. 2022 **Spatial Factor Modeling: A Bayesian Matrix-Normal Approach for Massive Spatial Data with Missing Observations.**
SIAM, Conference on Mathematics of Data Science, San Diego, CA, USA
- Aug. 2022 **Spatial Factor Modeling: A Bayesian Matrix-Normal Approach for Massive Spatial Data with Missing Observations.**
JSM, Washington, DC, USA
- Apr. 2022 **Pathfinder: A parallel quasi-Newton algorithm for reaching regions of high probability mass.**
SIAM Conference on Uncertainty Quantification (UQ22), Atlanta, Georgia, U.S.
- Nov. 2021 **Pathfinder: Parallel quasi-Newton variational inference.**
Broad Institute, Remote
- Sep. 2021 **Spatial Factor Modeling: A Bayesian Matrix-Normal Approach for Massive Spatial Data with Missing Observations.**
Mathematics and Applied Mathematics at Fudan University, Shanghai, China
- Sep. 2021 **Spatial Factor Modeling: A Bayesian Matrix-Normal Approach for Massive Spatial Data with Missing Observations.**
School of Statistics and Management at Shanghai University of Finance and Economics, Shanghai, China

- Jun. 2021 **Spatial Factor Modeling: A Bayesian Matrix-Normal Approach for Massive Spatial Data with Missing Observations.**
Biostatistics at Columbia University, New York, New York, USA
- Dec. 2020 **Spatial Factor Modeling: A Bayesian Matrix-Normal Approach for Mis-aligned Data.**
Johns Hopkins University BLAST working group, Baltimore, Maryland, USA
- Mar. 2020 **High-dimensional Multivariate Geostatistics: A Bayesian Matrix-Normal Approach.**
ENAR, Nashville, Tennessee, USA
- Contributed**
- Aug. 2022 **Bayesian Predictive Stacking Under Spatial Process Settings.**
IMSI Workshop, Chicago, IL, USA
- Aug. 2021 **Pathfinder: A Parallel Quasi-Newton Algorithm for Reaching Regions of High Probability Mass.**
Joint Statistical Meetings
- Aug. 2020 **Spatial Factor Modeling: A Bayesian Matrix-Normal Approach for Mis-aligned Data.**
Bernoulli-IMS One World Symposium 2020
- Jul. 2019 **Bayesian Linear Model of Coregionalization (BLMC) for Large Scale Datasets with Accelerated Posterior Sampling Algorithm.**
Joint Statistical Meetings, Colorado, USA, poster presentation
- Aug. 2017 **Practical Bayesian Inference Based on Nearest Neighbor Gaussian Processes Model for Massive Spatial Data.**
Joint Statistical Meetings, Baltimore, Maryland, USA

Referee Experience

Journal of the Royal Statistical Society: Series B (1)
Biometrics (1)
Journal of Machine Learning (1)
Journal of Computational and Graphical Statistics (4)
Annals of Applied Statistics (1)
Bayesian Analysis (1)
Nature Communications (1)
Statistical Science (1)
Environmetrics (1)

Professional Memberships

American Statistical Association
Eastern North American Region
International Chinese Statistical Association