

# 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<sup>†</sup>, **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](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<sup>†</sup>, **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<sup>†</sup>, Erika Garcia, **Lu Zhang**. The functional average treatment effect, <https://arxiv.org/abs/2312.00219>

#### 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/JaLAJni/JaLAJni>

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## 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

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## 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**

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## Working Experience

Jun. - Sep. 2018 **Internship in Biostatistics**, *Mayo Clinic*, Rochester, Minnesota USA,  
Sponsor: Yin Jun, Ph.D.

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

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## 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

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## Talks

Invited

- 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 Misaligned 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 Misaligned 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

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## 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)

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## Professional Memberships

American Statistical Association  
Eastern North American Region  
International Chinese Statistical Association