

# Ray Bai

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## Research Interests

Bayesian methodology and theory, scalable algorithms for large and complex data sets, semiparametric and nonparametric models, meta-analysis, spatial statistics, analysis of electronic health records

## Academic Employment

- 2020- Assistant Professor, University of South Carolina, Department of Statistics
- 2018-2020 Postdoctoral Researcher, University of Pennsylvania, Perelman School of Medicine  
Supervisors: Yong Chen and Mary Boland

## Education

- 2014-2018 PhD in Statistics, University of Florida  
Dissertation: Bayesian High-Dimensional Models With Scale-Mixture Shrinkage Priors  
Advisor: Malay Ghosh
- 2014-2016 Master of Statistics, University of Florida  
Project: Irrigation Forecasting in Southwest Florida with Generalized Additive Models  
Advisor: Nikolay Bliznyuk
- 2010-2012 MS in Applied Mathematics, University of Massachusetts Amherst
- 2003-2007 BA in Economics and Government, Cornell University

## Honors and Awards

- Graduate School Fellowship, University of Florida, August 2014-August 2018
- Student Paper Competition Award, Section on Bayesian Statistical Science, Joint Statistical Meetings, January 2018
- Travel Award, College of Liberal Arts and Sciences, University of Florida, October 2017, April 2018
- Anderson Scholars Faculty Honoree, University of Florida, November 2016
- Residential First-Year Experience Student Choice Award, University of Massachusetts, March 2011

## Professional Society Memberships

American Statistical Association

International Society for Bayesian Analysis

International Biometric Society

## Papers

— = student advised by RB

\* = co-first author

† = alphabetical order

### Preprints

1. Deshpande, S. K., **Bai, R.**, Balocchi, C., Starling, J. E., and Weiss, J. (2021+). VCBART: Bayesian trees for varying coefficients. Invited revision at *Journal of the American Statistical Association*.
2. **Bai, R.** (2021+). A unified computational and theoretical framework for high-dimensional Bayesian additive models. Invited revision at *Statistica Sinica*.
3. Meeker, J. R., Canelón, S. P., **Bai, R.**, Levine, L. D., and Boland, M. R. (2021+). Individual- and neighborhood-level risk factors for severe maternal morbidity. Invited revision at *Obstetrics and Gynecology*.
4. **Bai, R.**, Boland, M. R., and Chen, Y. (2021+). Fast algorithms and theory for high-dimensional Bayesian varying coefficient models. Under review at *Journal of Machine Learning Research*.
5. **Bai, R.**, Lin, L., Boland, M. R., and Chen, Y. (2021+). A robust Bayesian Copas selection model for quantifying and correcting publication bias.

### Journal Publications

6. **Bai, R.** and Ghosh, M. (2021). On the beta prime prior for scale parameters in high-dimensional Bayesian regression models. *Statistica Sinica*, **31**.
7. **Bai, R.\***, Moran, G. E.\*, Antonelli, J. L.\*, Chen, Y., and Boland, M. R. (2020+). Spike-and-slab group lassos for grouped regression and sparse generalized additive models. *Journal of the American Statistical Association* (in press).
8. **Bai, R.** and Ghosh, M. (2019). Large-scale multiple hypothesis testing with the normal-beta prime prior. *Statistics*, **53**: 1210-1233.
9. **Bai, R.** and Ghosh, M. (2018). High-dimensional multivariate posterior consistency under global-local shrinkage priors. *Journal of Multivariate Analysis*, **167**: 157-170.
10. Duerr, I., Merrill, H. R., Wang, C., **Bai, R.**, Boyer, M. J., Dukes, M. D., and Bliznyuk, N. (2018). Forecasting urban water demand with statistical and machine learning methods using large space-time data. *Environmental Modelling and Software*, **102**: 29-38.

### *Refereed Conference Publications*

11. Boland, M. R., Liu, J., Balocchi, C., Meeker, J., **Bai, R.**, Mowery, D., and Herman, D. (2021). A method to link neighborhood-level covariates to COVID-19 infection patterns in Philadelphia using spatial regression. *AMIA 2021 Virtual Informatics Summit* (accepted).

### *Book Chapters*

12. **Bai, R.**, Ročková, V., and George, E. I. (2020+). Spike-and-slab meets LASSO: A review of the spike-and-slab LASSO. *Handbook of Bayesian Variable Selection*, Tadesse, M. and Vannucci, M. eds. Chapman & Hall/CRC Press (accepted pending minor revision).

### *Selected Works in Progress*

**Bai, R.**, Jeong, S., and Ročková, V. (2021+). Minimax rates and adaptive procedures for generalized nonparametric regression.

**Bai, R.\***, Balocchi, C.\*, Liu, J., Canelón, S., George, E. I., Chen, Y., and Boland, M. R. (2021+). A Bayesian hierarchical modeling framework for geospatial analysis of adverse pregnancy outcomes.

**Bai, R.** (2021+). Uncertainty quantification for Bayesian vector autoregressive models.

<sup>†</sup> **Bai, R.** and Qin, Q. (2021+). Analysis of MCMC algorithms for Gaussian process regression with automatic relevance determination kernels.

## Students Advised

### *PhD Students*

Zile Zhao (in progress). Studying high-dimensional regression and variational Bayes machine learning algorithms

### *Member of PhD committee*

Shan Zhong (in progress)

## Grants Funded

National Science Foundation (September 2020-August 2022). RII Track 1: Materials Assembly and Design Excellence in South Carolina: MADE in SC (OIA-1655740). \$30,000. PI: Prakash Nagarkatti, University of South Carolina. Role: Co-PI.

## Teaching Experience

### *University of South Carolina*

STAT 718: High-Dimensional Data (special topics course), Spring 2021

STAT 714: Linear Statistical Models, Fall 2020

## *University of Florida*

STA 3024: Introduction to Statistics II, Spring 2016

## Presentations

### *Invited Talks*

1. Seminar, School of Mathematical and Statistical Sciences, Arizona State University, January 2020
2. Seminar, Department of Statistics, Florida State University, January 2020
3. Seminar, Department of Mathematics & Statistics, San Diego State University, January 2020
4. Seminar, Department of Statistics, University of California, Santa Cruz, January 2020
5. Seminar, Department of Statistics, University of South Carolina, January 2020
6. Guest lecture, GCB533: Statistics for Genomics and Biomedical Informatics, University of Pennsylvania, December 2019
7. Statistics Student Seminar, University of Florida, April 2019
8. Invited talk, Department of Biostatistics, Epidemiology, and Informatics, University of Pennsylvania, March 2018

### *Contributed Talks*

1. Joint Statistical Meetings, Denver, CO, July 2019
2. Joint Statistical Meetings, Vancouver, BC, Canada, July 2018
3. Statistics Student Seminar, University of Florida, March 2018
4. Statistics Student Seminar, University of Florida, October 2017

### *Contributed Conference Posters*

1. Bayes Comp 2020, Gainesville, FL, January 2020
2. DBEI and CCEB Research Day, University of Pennsylvania, March 2019
3. O-Bayes 2017 Meeting, Austin, TX, December 2017

## Departmental Service

### *University of South Carolina*

Member of the PhD Qualification Exam Committee, 2021

Member of the Hiring Committee, 2021

### *University of Florida*

Organizer of Statistics Student Seminar Series, 2016-2017

## Professional Service

Grant reviewer for the National Science Foundation

Journal reviewer for: *The American Statistician* (1), *Annals of the Brazilian Academy of Sciences* (1), *Computational Statistics & Data Analysis* (1), *Journal of Statistical Planning and Inference* (2), *Journal of the American Statistical Association* (2), *Lifetime Data Analysis* (1), *Research Synthesis Methods* (1), *Scandinavian Journal of Statistics* (1), *Science China Mathematics* (1), *Statistical Methods in Medical Research* (1)

Judge for 2020 SBSS Student Paper Competition

## Other Employment

2014-2018 Graduate School Fellow, Department of Statistics, University of Florida

2012-2014 Systems Engineer, General Dynamics Mission Systems

2010-2012 Teaching Assistant, Department of Mathematics & Statistics, UMass Amherst

2007-2010 Business Analyst, State Street Bank & Trust

## Computer Skills

R, C/C++, Python, MATLAB, Octave, Julia, JAGS, Stan, Windows, Linux

Last updated: December 31, 2020