Runjing (Bryan) Liu

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Education

UC Berkeley; Berkeley, CA — *August 2016 to present*
PhD student, Statistics

Duke University; Durham, NC — *August 2012 to May 2016*
Major: Mathematics (BS), Minor: Biology
GPA: 3.99/4.00
Summa cum laude
Graduation with high distinction

Awards and Fellowships:

NSF graduate research fellow 2017
Julia Dale Prize in mathematics 2016
Barry Goldwater Scholarship Honorable Mention 2015
Phi Beta Kappa Academic Honor Society

Current Research:

I am a PhD student advised by Prof. Jon McAuliffe. I am interested in **approximate Bayesian inference** and am currently working on **variational methods**. Some projects include:

1. **Applications in astronomy:** I work on the cataloguing of large-scale astronomical surveys. A current problem involves the detection of light sources in crowded starfields, where sources are often blurred, and the exact number of sources must be inferred. We develop a Bayesian framework that incorporates physical models, and we leverage the flexibility of neural networks to do inference. The goal is to provide accurate estimation, proper uncertainty quantification, and sufficient scalability for the terabytes of data collected by astronomical surveys.
2. **Methods in Bayesian robustness:** Leveraging modern auto-differentiation tools, I am developing an efficient, automatic procedure to evaluate the sensitivity of posterior inferences to model assumptions, under the variational inference framework.
3. **Applications in genomics:** I work on the Berkeley Drosophila Genome project. I helped write an open-source Python package for *iterative Random Forest,* an extension of random forest developed for genomic data to detect stable high-order interactions that drive gene expressions.

Publications and pre-prints:

Liu R., Regier J., Tripuraneni N., Jordan M. I., McAuliffe J. "Rao-Blackwellized Stochastic Gradients for Discrete Distributions." *International Conference on Machine Learning.* June 2019. https://arxiv.org/pdf/1810.04777.pdf.

Giordano R., Stephenson W., **Liu R.,** Jordan M. I., Broderick T. "Return of the Infinitesimal Jackknife." *Conference on Artificial Intelligence and Statistics.* April 2019. https://arxiv.org/pdf/1806.00550.pdf.
-- selected for Notable Paper Award and oral presentation

Liu R., Giordano R., Jordan M. I., Broderick T. "Evaluating Sensitivity to the Stick Breaking Prior in Bayesian Nonparametrics." *NIPS*, *All of Bayesian Nonparametrics workshop*. December 2018. https://arxiv.org/pdf/1810.06587.pdf.
-- selected for the ISBA@NIPS Award
-- selected for contributed talk.

Giordano R., **Liu, R.**, Varoquaux N., Jordan M. I., Broderick T. “Measuring Cluster Stability for Bayesian Nonparametrics Using the Linear Bootstrap.” *NIPS*, *Advances in Approximate Bayesian Inference Workshop*. December 2017. https://arxiv.org/pdf/1712.01435.pdf.

Liu, R, Layton, A. "Modeling the Effects of Positive and Negative Feedback in Kidney Blood Flow Control." *Mathematical Biosciences*. June 2016: Vol. 276, pp 8-18.

Liu, R., Patel, M., Badal, J. "Encoding whisker deflection velocity within the rodent barrel cortex using phase-delayed inhibition." *Journal of Computational Neuroscience*. December 2014: Vol. 37, Issue 3, pp 387-401.

Work experience:

Data Science Intern at Google Cloud. *Summer 2019.* Worked on demand forecasting for Google data centers, and specifically on the development of general-purpose, validated prediction intervals.

Teaching:

Linear modeling: theory and applications. Graduate student instructor. *Fall 2018*
-- selected as Outstanding Graduate Student Instructor.
Introduction to time series. Graduate student instructor. *Spring 2019*

Skills:

Proficient in Python and R.

Other:

Berkeley **Statistics Graduate Student Association** co-president, *Fall 2018-Spring 2019*
Gave a student talk at the bi-annual **Berkeley Stanford Joint Statistics Colloquium**, *Fall 2017*
Middle school math tutor for **Bridging Berkeley***, Fall 2017*
Chaired workshop for the NSF graduate fellowship application, *Fall 2017*
Co-organizer for **Berkeley Datafest***, Spring 2017, 2018*
TA for **Duke TIP** in a number theory and cryptology course, *Summer 2015 and Summer 2016*