Dr. Brian L. Trippe

Contact Information

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Education

Massachusetts Institute of Technology, Cambridge, MA, USA — 2017–2022
Ph.D., Computational and Systems Biology. Advisor: Tamara Broderick
National Science Foundation - GRFP Fellow

University of Cambridge, Cambridge, UK — 2016–2017
MPhil., Engineering. Advisor: Richard E. Turner
Euretta J. Kellett Fellow

Columbia College, New York, NY, USA — 2012–2016
BA., Computer Science and Biochemistry
Summa Cum Laude

Academic Experience

Columbia University, New York, NY, USA — 2022–present
Department of Statistics
Postdoctoral Research Fellow. Advisors: David Blei and Simon Tavaré

University of Washington, Seattle, WA, USA — 2021–present
Institute for Protein Design
Visiting Researcher. Advisor: David Baker

Microsoft Research New England, Cambridge, MA, USA — 2021
Summer Research Intern. Advisors: Lorin Crawford and Kevin Yang

Google Research, Mountain View, CA, USA — 2014 & 2015
Summer Engineering Intern. Accelerated Sciences Team

Publications

L. Wu*, B. L. **Trippe***, C. A. Naesseth, D. M. Blei, and J. P. Cunningham. Practical and asymptotically exact conditional sampling in diffusion models. In *Neural Information Processing Systems*, 2023.

J. Yim*, B. L. **Trippe***, V. De Bortoli*, E. Mathieu*, A. Doucet, R. Barzilay, and T. S. Jaakkola. SE(3) diffusion model with application to protein backbone generation. In *International Conference on Machine Learning*, 2023.

R. Berlinghieri, B. L. **Trippe**, D. R. Burt, R. Giordano, K. Srinivasan, T. Özgökmen, J. Xia, and T. Broderick. Gaussian processes at the Helm(holtz): a more fluid model for ocean currents. In *International Conference on Machine Learning*, 2023.

J. L. Watson*, D. Juergens*, N. R. Bennett*, B. L. **Trippe***, J. Yim*, H. E. Eisenach*, W. Ahern*, A. J. Borst, R. J. Ragotte, L. F. Milles, B. I. M. Wicky, N. Hanikel, S. J. Pellock, A. Courbet, W. Sheffler, J. Wang, P. Venkatesh, I. Sappington, S. V. Torres, A. Lauko, V. De Bortoli, E. Mathieu, S. Ovchinnikov, R. Barzilay, T. S. Jaakkola, F. DiMaio, M. Baek, and D. Baker. De novo design of protein structure and function with RFdiffusion. *Nature*, 2023.

B. L. **Trippe**, S. K. Deshpande, and T. Broderick. Confidently comparing estimates with the c-value. *Journal of the American Statistical Association*, 2023.

E. M. Weeks, J. C. Ulirsch, N. Y. Cheng, B. L. **Trippe**, R. S. Fine, J. Miao, T. A. Patwardhan, M. Kanai, J. Nasser, C. P. Fulco, K. C. Tashman, F. Aguet, T. Li, J. Ordovas-Montanes, C. S. Smillie, A. K. Biton Moshe Shalek, A. N. Ananthakrishnan, R. J. Xavier, A. Regev, R. M. Gupta, K. Lage, K. G. Ardlie, J. N. Hirschhorn, E. S. Lander, J. M. Engreitz, and H. K. Finucane. Leveraging polygenic enrichments of gene features to predict genes underlying complex traits and diseases. *Nature Genetics*, 2023.

B. L. **Trippe***, J. Yim*, D. Tischer, T. Broderick, D. Baker, R. Barzilay, and T. Jaakkola. Diffusion probabilistic modeling of protein backbones in 3D for the motif-scaffolding problem. In *International Conference on Learning Representations*, 2023.

B. L. **Trippe**, B. Huang, E. A. DeBenedictis, B. Coventry, N. Bhattacharya, K. K. Yang, D. Baker, and L. Crawford. Randomized gates allow unbiased estimation in sort-seq assays. *Protein Science*, 2022.

T. D. Nguyen, B. L. **Trippe**, and T. Broderick. Many processors, little time: MCMC for partitions via optimal transport couplings. In *International Conference on Artificial Intelligence and Statistics*, 2022.

B. L. **Trippe**, H. K. Finucane, and T. Broderick. For high-dimensional hierarchical models, consider exchangeability of effects across covariates instead of across datasets. In *Advances in Neural Information Processing Systems*, 2021.

B. L. **Trippe**, T. D. Nguyen, and T. Broderick. Optimal transport couplings of Gibbs samplers on partitions for unbiased estimation. In *Advances in Approximate Bayesian Inference*, 2021.

B. L. **Trippe**, J. H. Huggins, R. Agrawal, and T. Broderick. LR-GLM: High-dimensional Bayesian inference using low-rank data approximations. In *International Conference on Machine Learning*, 2019.

R. Agrawal, B. L. **Trippe**, J. H. Huggins, and T. Broderick. The kernel interaction trick: Fast Bayesian discovery of pairwise interactions in high dimensions. In *International Conference on Machine Learning*, 2019.

C. Zheng, F. Q. Jin, B. L. **Trippe**, J. Wu, and M. Chalfie. Inhibition of cell fate repressors secures the differentiation of the touch receptor neurons of Caenorhabditis elegans. *Development*, 145(22), 2018.

B. L. **Trippe** and R. Turner. Overpruning in variational Bayesian neural networks. In *NeurIPS Workshop on Advances in Approximate Bayesian Inference*, 2017.

B. L. **Trippe** and R. E. Turner. Conditional density estimation with Bayesian normalising flows. In *NeurIPS Workshop on Bayesian Deep Learning*, 2017.

B. L. **Trippe**, S. Prabhakaran, and H. J. Bussemaker. K-mer motif multinomial mixtures, a scalable framework for multiple motif discovery. *bioRxiv*:096735, 2016.

* = equal contribution

Patents

J. L. Watson, D. C. Juergens, N. Bennett, B. L. **Trippe**, J. Yim, and D. Baker. Universal generative protein design with rosettafold diffusion, filed 2023.

B. L. **Trippe**, L. A. Crawford, K. K. Yang, and N. Bhattacharya. Unbiased sorting and sequencing of objects via randomized gating schemes, pending 2023.

M. T. H. Dimon, M. Berndl, M. A. Coram, B. L. **Trippe**, P. F. Riley, and P. C. Nelson. Neural network for processing aptamer data, granted 2020.

Invited Talks

De novo design of protein structure and function with RFdiffusion
Harvard Medical School – SBGrid Consortium, Boston, MA, USA / Virtual — April 9 2024
NeurIPS – Machine Learning in Structural Biology, New Orleans, LA, USA — December 2023
NeurIPS – Workshop on Diffusion Models, New Orleans, LA, USA — December 2023
Universidad Nacional de Colombia, Bogota, Colombia / Virtual — January 2023

Twisted diffusion sampling for accurate conditional generation with application to protein design
Oxford University – CS-ML Seminar, Oxford, UK — June 2023

Diffusion probabilistic modeling of protein backbones in 3D for the motif-scaffolding problem
SIAM Conference on Uncertainty Quantification, Trieste, Italy — March 2024
Microsoft Research AI for Science, Cambridge, UK / Virtual — April 2023
Valence Discovery – Molecular Modeling and Drug Discovery Series, Virtual — October 2022
Machine Learning for Protein Engineering Seminar Series, Virtual — September 2022

Confidently comparing estimators with the c-value
Columbia University – Statistics GR8201 Guest Lecture — February 2023
Microsoft Research New England — March 2021

Probabilistic protein design with diffusion generative models
Columbia University – Statistics Student Seminar, New York, NY, USA — February 2023
Dartmouth College – ENGS 58 Guest Lecture, Hanover, NH, USA / Virtual — February 2023
Harvard University – CS 282r Guest Lecture, Cambridge, MA, USA — September 2022

For high-dimensional hierarchical models, consider exchangeability of effects across covariates instead of across datasets
Flatiron Institute – Center for Computational Mathematics, New York, NY — October 2022
Microsoft Research New England, Cambridge MA, USA — February 2022
NeurIPS – Learning Meaningful Representations of Life Workshop, Virtual — December 2021
Broad Institute – Models Inference and Algorithms Seminar, Cambridge, MA, USA — December 2021

LR-GLM: high-dimensional Bayesian inference using low-rank data approximations
Broad Institute – Models Inference and Algorithms Primer, Cambridge, MA, USA — October 2018

Conditional density estimation with Bayesian normalizing flows
Prowler.io, Cambridge, UK — December 2017

Contributed Talks

New Monte Carlo methods for backbone generation with diffusion generative models
RosettaCon, Seattle, WA — August 2023

Confidently comparing estimators with the c-value
Approximation Methods in Bayesian Analysis, CIRM Marseille, France — June 2023
Joint Statistical Meetings, Virtual — August 2021

Many processors, little time: MCMC for partitions via optimal transport couplings
International Conference on Bayesian Nonparametrics, Puerto Varas, Chile — October 2022
International Society for Bayesian Analysis, Montreal, QC, Canada — July 2022

High-dimensional hierarchical modeling via exchangeability of effects across covariates
Joint Statistical Meetings, Washington, DC, USA — August 2022
Bayesian Young Statisticians Meeting, Virtual — September 2021

Optimal transport couplings of Gibbs samplers on partitions for unbiased estimation
Advances in Approximate Bayesian Inference Symposium, Virtual — January 2021

Bayes estimates for multiple related regressions under exchangeability among covariates
Joint Statistical Meetings, Washington, DC, USA / Virtual — August 2020

LR-GLM: high-dimensional Bayesian inference using low-rank data approximations
International Conference on Machine Learning, Long Beach, CA, USA — June 2019

Honors and Awards

Travel Award, International Society for Bayesian Analysis (ISBA) (2022)
Schmidt Science Fellowship Finalist (2022)
NSF Graduate Research Fellowship (2018-2022)
Travel Award, International Conference on Machine Learning (2019)
Hertz Foundation Fellowship Finalist (2018)
Euretta J. Kellett Fellowship (support for study at Cambridge UK) (2016-2017)
Half Blue in Water Polo, University of Cambridge (2017)
Phi Beta Kappa, Columbia College (2016)
Summa Cum Laude, Columbia College (2016)
Departmental Honors in Biological Sciences, Columbia University (2016)
Departmental Honors in Computer Science, Columbia University (2016)
Barry Goldwater Scholarship (2015)

Teaching and Professional Service

Conference Reviewing

- International Conference on Artificial Intelligence and Statics (AISTATS)
- International Conference on Learning Representations (ICLR)
- International Conference on Machine Learning (ICML)
- Neural Information Processing Systems (NeurIPS)
- Symposium on Advances in Approximate Bayesian Inference (AABI)
- Uncertainty in Artificial Intelligence (UAI)

Journal Reviewing

- Annals of Applied Statistics (AOAS)
- Proceedings of the National Academy of Sciences (PNAS)

Other Service

- Founding Co-organizer, Machine Learning for Protein Engineering Seminar Series 2022
- Graduate Student Council Member, MIT Committee on Undergraduate Admissions and Financial Aid 2020-2022

Teaching

Massachusetts Institute of Technology, Cambridge, MA, USA

- Teaching Assistant, 6.435 Bayesian Modeling and Inference (Graduate-level) Spring 2019
- Volunteer Teacher for High School Studies Program, Networks Everywhere Summer 2018

University of Cambridge, Cambridge, UK

- Supervision Leader, Part IIA 3G3 Introduction to Neuroscience Lent Term 2017

Columbia University

- Teaching Assistant, COMS W3157 Advanced Programming Fall 2014 and Spring 2015
- Teaching Assistant, COMS W3203 Discrete Mathematics Fall 2013 and Spring 2014