Andrew J. Holbrook, Ph.D.

Assistant Professor, UCLA Biostatistics
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Research Interests

Bayesian statistics and machine learning, dimension reduction, computational neuroscience, spatial epidemiology

Dissertation title: *Geometric Bayes*; Advisor: Prof. Babak Shahbaba, Ph.D.

Education

2013-2018, Ph.D., Statistics, University of California, Irvine, CA

2013-2015, M.S., Statistics, University of California, Irvine, CA

2005-2009, B.A., German and Classical Languages, *with Honors*, University of California, Berkeley, CA

Awards and Academic Honors

NIH K25 Career Development Award (2020-2025)

Leonard J. Savage Award, International Society for Bayesian Analysis (2018)
Honorable Mention for a Dissertation in Theory and Methods

Carl W. Cotman Young Investigator Award, UCI MIND (2018)

UC Irvine Graduate Dean's Dissertation Fellowship Award (2017-2018)

UCI MIND Aging Fellowship (2015-2017)

Robert L. Newcomb 1st Year Graduate Student Award, UC Irvine Department of Statistics (2014)

Refereed Publications

14. Tustison N, Cook P, **Holbrook A**, Johnson H, Muschelli J, Devanyi G, Duda J, Das S, Cullen N, Gillen D, Yassa M, Stone J, Gee J, Avants B. *ANTsX: A dynamic ecosystem for quantitative biological and medical imaging*. Scientific Reports, vol. 11, no. 9068, 2021.

13. **Holbrook A**, Loeffler C, Flaxman S, Suchard M. *Scalable Bayesian inference for self-excitatory stochastic processes applied to big American gunfire data*. Statistics and Computing, vol. 31, no. 4, 2021.

12. **Holbrook A**, Lemey P, Baele G, Dellicour S, Brockmann D, Rambaut A, Suchard M. *Massive parallelization boosts big Bayesian multidimensional scaling*. Journal of Computational and Graphical Statistics, vol. 30, no. 1, pp. 11-24, 2021.

11. Shahbaba B, Lan S, Streets J, **Holbrook A**. *Nonparametric Fisher geometry with application to density estimation*. Proceedings of the 36th Conference on Uncertainty in Artificial Intelligence (UAI), PMLR vol. 124, pp. 101-110, 2020.

10. **Holbrook A**, Tustison N, Marquez F, Roberts J, Yassa M, Gillen D. *Anterolateral entorhinal cortex thickness as a biomarker for early detection of Alzheimer's disease*. Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring, vol. 12, no. 1, 2020.

9. Ji X, Zhang Z, **Holbrook A**, Nishimura A, Baele G, Rambaut A, Lemey P, Suchard M. *Gradients* do *grow on trees: a linear-time O(N)-dimensional gradient for statistical phylogenetics*. Molecular Biology and Evolution, vol. 37, no. 10, pp. 3047-3060, 2020.

8. Lan S, **Holbrook A**, Elias G, Fortin N, Ombao H, Shahbaba B. *Flexible Bayesian Dynamic Modeling of Correlation and Covariance Matrices*. Bayesian Analysis, vol. 15, no. 4, pp. 1199-1228, 2020.

7. **Holbrook A**, Lumley T, Gillen D. *Estimating prediction error for complex samples*. Canadian Journal of Statistics, vol. 48, no. 2, pp. 204-221, 2020.

6. Tustison N, **Holbrook A**, Avants B, Roberts J, Cook P, Reagh Z, Stone J, Gillen D, Yassa M. *Longitudinal mapping of cortical thickness measurements: an Alzheimer's Disease Neuroimaging Initiative-based evaluation study*. Journal of Alzheimer's Disease, vol. 71, no. 1, pp. 165-183, 2019.

5. Li L, **Holbrook A**, Shahbaba B, Baldi P. *Neural network gradient Hamiltonian Monte Carlo*. Computational Statistics, vol. 34, no. 1, pp. 281-299, 2019.

4. **Holbrook A**. *Differentiating the pseudo determinant*. Linear Algebra and its Applications, vol. 548, pp. 293-304, 2018.

3. **Holbrook A**, Lan S, Vandenberg-Rodes A, Shahbaba B. *Geodesic Lagrangian Monte Carlo over the space of positive definite matrices: with application to Bayesian spectral density estimation.* Journal of Statistical Computation and Simulation, vol. 88, no. 5, pp. 982-1002, 2018.

2. **Holbrook A**, Vandenberg-Rodes A, Fortin N, Shahbaba B. *A Bayesian supervised dual-dimensionality reduction model for simultaneous decoding of LFP and spike train signals.* Stat Journal, vol. 6, no. 1, pp. 53-67, 2017.

1. Grill J, **Holbrook A**, Pierce A, Hoang D, Gillen D. *Attitudes toward Potential Participant Registries.* Journal of Alzheimer's Disease, vol. 56, no. 3, pp. 939-946, 2017.

Current Support

NIH NIAID K25 AI153816 (PI) 06/01/2020 - 05/31/2025, $106,467/year.
Title: Big Data Predictive Phylogenetics with Bayesian Learning

Invited Talks

9. Bayesian Inference in Stochastic Processes (BISP12), "From viral evolution to spatial contagion: a biologically modulated Hawkes model" (Virtual; May 2021)
8. University of California, Los Angeles, Department of Mathematics, Applied Math Colloquium, "From viral evolution to spatial contagion: a biologically modulated Hawkes model" (Los Angeles, CA; Mar 2021)
7. University of California, Los Angeles, Department of Statistics, "Bayesian modeling of global viral diffusions at scale" (Los Angeles, CA; Dec 2020)
6. Tulane University, Department of Mathematics, "Bayes in the time of Big Data" (New Orleans, LA; Nov 2020)
5. University of California, San Francisco, Department of Epidemiology and Biostatistics, "Bayesian modeling of global viral diffusions at scale" (San Francisco, CA; Nov 2020)
4. University of Auckland, Department of Statistics, Bayesianz Research Group, "Bayes in the time of Big Data" (Auckland, NZ; Nov 2020)
3. Johns Hopkins University, Department of Biostatistics, Bayesian Learning and Spatial Temporal modeling (BLAST) working group, "Bayes in the time of Big Data" (Baltimore, MD; Oct 2020)
2. JSM Savage Award Session, "Excerpts from *Geometric Bayes*" (Denver, CO; Aug 2019)
1. Statistical Methods in Imaging, "Evaluating the ANTs longitudinal cortical thickness pipeline" (Irvine, CA; Jun 2019)

Teaching

- Teaching Assistant, Stat 7 – Introduction to Probability and Statistics (Fall 2014, Summer 2015); Department of Statistics, University of California, Irvine
- Teaching Assistant, Stat 8 – Biostatistics (Winter 2015); Department of Statistics, University of California, Irvine

- Teacher, Mathematics and English as a Second Language (2010-2011); Dalian American International School

Professional Experience

- Postdoctoral scholar with Prof. Marc A. Suchard, M.D., Ph.D. at the Department of Human Genetics, University of California, Los Angeles; Los Angeles, California (2018-2020)
- Statistical consultant, the Alzheimer's Disease Research Center at the University of California, Irvine; Irvine, California (2015-2017)
- Statistical consultant, the Center for Statistical Consulting at the University of California, Irvine; Irvine, California (Winter and Spring 2014)
- Trainee, the Summer Institute for Training in Biostatistics at North Carolina State University and the Duke Clinical Research Institute; Raleigh, North Carolina (Summer 2013)
- Teacher, the Dalian American International School; Dalian, People's Republic of China (2010-2011)

Service and Community Involvement

- Lead organizer, *Conference on philosophy of machine learning: knowledge and causality*. March 17-18, 2018 at the University of California, Irvine
- Member, American Statistical Association (2018-present)
- Member, International Society for Bayesian Analysis (2020-present)

Journal Reviewer

Alzheimer's & Dementia: The Journal of the Alzheimer's Association $(\times 2)$

Bayesian Analysis $(\times 2)$

IEEE Transactions on Industrial Electronics

Scandinavian Journal of Statistics

SIAM Journal on Matrix Analysis and Applications

Statistics and Computing