

Benjamin Shaby

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Research Interests

Spatial statistics, Bayesian modeling, Bayesian computation, extreme values, geophysical applications

Professional Experience

Department of Statistics, Colorado State University, Fort Collins, CO <i>Associate Professor (with tenure)</i> <i>Assistant Professor</i>	2020–present 2019–2020
Department of Statistics, Pennsylvania State University, University Park, PA <i>Associate Professor (with tenure)</i> <i>Assistant Professor</i>	2019 2013–2019
Department of Statistics, UC Berkeley, Berkeley, CA <i>Postdoctoral Fellow</i>	2011–2013
Statistics and Applied Mathematical Sciences Institute, Durham, NC <i>Postdoctoral Fellow</i>	2009–2011

Education

Cornell University, Ithaca, NY PhD, Statistics MS, Statistics	2009 2006
Stanford University, Stanford, CA BS, Mathematical and Computational Science, with honors AB, English	2001 2001

Honors and Awards

- National Science Foundation **CAREER Award** **2018**
- Paper *An exponential-gamma mixture for extreme Santa Ana winds* selected for the “Showcases of the *Environmetrics* Journal” session at the Annual Conference of the International Environmetrics Society, Guanajuato, Mexico **2018**
- **Young Investigator Award**, ASA Section on Statistics and the Environment **2016**
- Paper *Tapered Covariance: Bayesian Estimation and Asymptotics* selected for the “JCGS Highlights” session at the Interface Symposium, Orange, CA **2013**
- Outstanding Poster award for “Putting citizen science to work” at the ASA Environmetrics Section Meeting, Boulder, CO **2008**
- Edna Bailey Sussman Environmental Scholarship **2004**
- Cornell University Graduate Fellowship **2003–2004**

Publications

Journal Articles

- Wijeyakulasuriya, D. A., Hanks, E. M., Shaby, B. A., & Eisenhauer, E. (2020). Machine learning for modeling animal movement. *PLOS One*, 15(7), e0235750
- Zhang, L., Shaby, B. A., & Wadsworth, J. L. (2021+). Hierarchical transformed scale mixtures for flexible modeling of spatial extremes on datasets with many locations. *J. Amer. Statist. Assoc.* To appear
- Bopp, G. P., Shaby, B. A., & Huser, R. (2021+). A hierarchical max-infinitely divisible spatial model for extreme precipitation. *J. Amer. Statist. Assoc.* To appear
- Bopp, G. P., Shaby, B. A., Forest, C. E., & Mejia, A. (2020). Projecting flood-inducing precipitation with a Bayesian analogue model. *J. Agric. Biol. Environ. Stat.*, 25(2), 229–249
- Nascimento, M. & Shaby, B. A. (2019). Spatial semi-parametric spectral density estimation for multivariate extremes, with application to fire risk. *J. Environ. Stat.*, 9(3)
- Reich, B. J. & Shaby, B. A. (2019). A spatial Markov model for climate extremes. *J. Comput. Graph. Statist.*, 28(1), 117–126
- Wijeyakulasuriya, D. A., Hanks, E. M., Shaby, B. A., & Cross, P. C. (2019). Extreme value based methods for modeling elk dispersal. *J. Agric. Biol. Environ. Stat.*, 24(1), 73–91
- Reich, B. J. & Shaby, B. A. (2018). Modeling of multivariate spatial extremes. *RESEARCHERS.ONE*. <https://www.researchers.one/article/2018-09-12>
- Bopp, G. P. & Shaby, B. A. (2017). An exponential-gamma mixture model for extreme Santa Ana winds. *Environmetrics*, 28(8), e2476, 14
- Skibinski, G., Hwang, V., Ando, D. M., Daub, A., Lee, A. K., Ravisankar, A., Modan, S., Finucane, M. M., Shaby, B. A., & Finkbeiner, S. (2017). Nrf2 mitigates Irfk2- and α -synuclein-induced neurodegeneration by modulating proteostasis. *Proc. of the Nat. Acad. Sciences*, 114(5), 1165–1170
- Shaby, B. A., Skibinski, G., Ando, M., LaDow, E. S., & Finkbeiner, S. (2016b). A three-groups model for high-throughput survival screens. *Biometrics*, 72(3), 936–944
- Shaby, B. A., Reich, B. J., Cooley, D., & Kaufman, C. G. (2016a). A Markov-switching model for heat waves. *Ann. Appl. Stat.*, 10(1), 74–93
- Stephenson, A. G., Shaby, B. A., Reich, B. J., & Sullivan, A. L. (2015). Estimating spatially varying severity thresholds of a forest fire danger rating system using max-stable extreme-event modeling. *J. of Appl. Meteo. and Clim.*, 54(2), 395–407
- Tingley, M. P. & Shaby, B. A. (2015). Comments on: Comparing and selecting spatial predictors using local criteria. *TEST*, 24(1), 47–53
- Reich, B. J., Shaby, B. A., & Cooley, D. (2014). A hierarchical model for serially-dependent extremes: a study of heat waves in the western US. *J. Agric. Biol. Environ. Stat.*, 19(1), 119–135
- Eidsvik, J., Shaby, B. A., Reich, B. J., Wheeler, M., & Niemi, J. (2014). Estimation and Prediction in Spatial Models With Block Composite Likelihoods. *J. Comput. Graph. Statist.*, 23(2), 295–315
- Shaby, B. A. (2014). The Open-Faced Sandwich Adjustment for MCMC Using Estimating Functions. *J. Comput. Graph. Statist.*, 23(3), 853–876
- Tsvetkov, A. S., Arrasate, M., Barmada, S., Ando, D. M., Sharma, P., Shaby, B. A., & Finkbeiner, S. (2013). Proteostasis of polyglutamine varies among neurons and predicts neurodegeneration. *Nature Chem. Biol.*, 9(9), 586

- Reich, B., Cooley, D., Foley, K., Napelenok, S., & Shaby, B. (2013). Extreme value analysis for evaluating ozone control strategies. *Ann. Appl. Stat.*, 7(2), 739–762
- Kaufman, C. G. & Shaby, B. A. (2013). The role of the range parameter for estimation and prediction in geostatistics. *Biometrika*, 100(2), 473–484
- Shaby, B. A. & Reich, B. J. (2012a). Bayesian spatial extreme value analysis to assess the changing risk of concurrent high temperatures across large portions of European cropland. *Environmetrics*, 23(8), 638–648
- Reich, B. J. & Shaby, B. A. (2012). A hierarchical max-stable spatial model for extreme precipitation. *Ann. Appl. Stat.*, 6(4), 1430–1451
- Shaby, B. A. & Reich, B. J. (2012b). Discussion of “Statistical Modeling of Spatial Extremes” by A. C. Davison, S. A. Padoan and M. Ribatet. *Statist. Sci.*, 27(2), 197–198
- Shaby, B. & Ruppert, D. (2012). Tapered covariance: Bayesian estimation and asymptotics. *J. Comp. Graph. Statist.*, 21(2), 433–452
- Miller, J., Arrasate, M., Brooks, E., Peters-Libeu, C., Legleiter, J., Hatters, D., Curtis, J., Cheung, K., Krishnan, P., Mitra, S., Widjaja, K., Shaby, B., Newhouse, Y., Lotz, G., Thulasiramin, V., Saudou, P., Muchowski, P., Segal, M., Weisgraber, K., & Finkbeiner, S. (2011). Identifying polyglutamine species proteins *in situ* that best predict neurodegeneration. *Nature Chemical Biology*, 7(12), 925–934
- Shaby, B. & Fink, D. (2011). Embedding black-box regression techniques into hierarchical Bayesian models. *J. Stat. Comp. and Simul.*, 82(12), 1753–1766
- Miller, J., Arrasate, M., Shaby, B., Mitra, S., Masliah, E., & Finkbeiner, S. (2010). Quantitative relationships between huntingtin levels, polyglutamine length, inclusion body formation, and neuronal death provide novel insight into huntington’s disease molecular pathogenesis. *J. of Neuroscience*, 30(31), 10541–10550
- Shaby, B. A. & Field, C. B. (2006). Regression tools for CO₂ inversions: application of a shrinkage estimator to process attribution. *Tellus (B)*, 58, 279–292

Reports to Government Agencies

- Sapsis, D., Brown, T., Low, C., Moritz, M., Saah, D., & Shaby, B. (2016). Mapping environmental influences on utility fire threat. A Report to the California Public Utilities Commission Pursuant to R.0811-005 and R.15-05-006
- Shaby, B., Mejia, A., & Bopp, G. (2018). Development and evaluation of a statistical model for non-stationary precipitation frequency estimates with NOAA Atlas 14. NOAA, National Weather Service, Silver Spring, MD

Technical Reports

- Shaby, B. & Wells, M. (2010). *Exploring an adaptive Metropolis algorithm*. Technical Report 1011-14, Duke University Department of Stastical Science

Invited Talks

Projecting Flood-Inducing Precipitation with a Bayesian Analogue Model *Workshop on Risk Analysis for Extremes in the Earth System, July 24, 2019, Berkeley, CA*

A model-based analogue model for assessing flood risk in future climates *11th International Conference on Extreme Value Analysis, July 4, 2019, Zagreb, Croatia*

Max-Infinitely Divisible Models for Spatial Extremes Using Random Effects *IMS/ASA Spring Research Conference, May 23, 2019, Blacksburg, VA*

Max-Infinitely Divisible Models for Spatial Extremes Using Random Effects *SIAM Conference on Mathematics of Planet Earth, September 17, 2018, Philadelphia, PA*

Sub-Asymptotic Models for Spatial Extremes Using Random Effects *Joint Statistical Meetings, August 2, 2018, Vancouver, Canada*

An exponential-gamma mixture model for extreme Santa Ana winds *Annual Conference of the International Environmetrics Society, July 17, 2018, Guanajuato, Mexico*

Hierarchical Scale Mixtures for Flexible Spatial Modeling of Extremes *International Society for Bayesian Analysis World Meeting, June 26, 2018, Edinburgh, Scotland*

Max-Infinitely Divisible Models for Spatial Extremes Using Random Effects. *SAMSI Climate Extremes Workshop, May 16, 2018, Research Triangle Park, NC*

Hierarchical Scale Mixtures for Flexible Spatial Modeling of Extremes *Workshop on Environmental Risk Modeling and Extreme Events, August 29, 2017, Montreal, Canada*

Hierarchical Scale Mixtures for Flexible Spatial Modeling of Extremes *10th International Conference on Extreme Value Theory, June 27, 2017, Delft, Netherlands*

Latent variable models for environmental extremes. *STOR-i Workshop on Multivariate and Spatial Extremes, July 4, 2016, Lancaster, UK*

Latent variable models for environmental extremes. *International Society for Bayesian Analysis World Meeting, June 17, 2016, Sardinia, Italy*

Latent variable models for environmental extremes. *Workshop on Uncertainty and Causality Assessment in Modeling Extreme and Rare Events, April 26, 2016, Boulder, CO*

Latent variable models for environmental extremes. *ENVR/EnviBayes Workshop on Bayesian Environmetrics, April 2, 2016, Columbus, OH*

Spatial extreme value analysis for fire risk assessment. *8th International Conference of the ERCIM WG on Computational and Methodological Statistics, December 12, 2015, London, UK*

Spatial extreme value analysis for fire risk assessment. *2015 IMS-China International Conference on Statistics and Probability, July 3, 2015, Kunming, China*

Downscaling extremes for fire risk assessment. *9th International Conference on Extreme Value Theory June 16, 2015, Ann Arbor, Michigan*

Spatial extreme value analysis for fire risk assessment. *Center of Statistics and Applications, University of Lisbon, January 7, 2015, Lisbon, Portugal*

A Bayesian model for integrating genetics and cell biology. *NIH Workshop on Parkinson's Disease Genetics and Systems Biology, June 5, 2014, Bethesda, MC*

Fully Bayesian inference for spatial extremes using hierarchical extreme value processes. *Joint Mathematical Meetings, January 8, 2014, Baltimore, MD*

Fully Bayesian inference for spatial extremes using hierarchical extreme value processes. *EVT2013: Extremes in Vimeiro Today, September 10, 2013, Vimeiro, Portugal*

Hierarchical processes for spatial extremes. *Joint Statistical Meetings 2013, Montreal, Canada*

Bayesian spatial extreme value analysis to assess the changing risk of concurrent high temperatures across large portions of European cropland. *ASA Environmetrics Section meeting, October 5, 2012, Raleigh, NC*

A hierarchical Bayesian extreme value theory approach to modeling heat waves. *Joint Statistical Meetings 2012, San Diego, CA*

A more practical max-stable process for spatial extremes. *UC Berkeley Neyman Seminar, September 7, 2011, Berkeley, CA*

MCMC without the likelihood via the open-faced sandwich adjustment. *ASA Environmetrics Section meeting, October 15, 2010, Boulder, CO*

Approximate Bayesian computing for spatial extremes via open-faced sandwich adjustment. *SAMSI Space-Time Analysis for Environmental Mapping, Epidemiology and Climate Change Transition Workshop, October 11, 2010, Durham, NC*

Approximate Bayesian computing for spatial extremes via open-faced sandwich adjustment. *Joint Statistical Meetings 2010, Vancouver, BC*

Putting citizen science to work: embedding black-box regression techniques into hierarchical Bayesian models. *Joint Statistical Meetings 2009, Washington, DC*

Seminars and Other Presentations

Modeling First Arrival of Migratory Birds using a Hierarchical Max-infinitely Divisible Process. *UC Santa Cruz, Department of Statistics Seminar, November 30, 2020, Santa Cruz, CA*

Flexible Modeling of Spatial Extremes on Datasets with Many Locations. *Oregon State University, Department of Statistics Seminar, March 2, 2020, Corvallis, OR*

Max-Infinitely Divisible Models for Spatial Extremes Using Random Effects. *Colorado State University, Department of Statistics Seminar, January 31, 2019, Fort Collins, CO*

Max-Infinitely Divisible Models for Spatial Extremes Using Random Effects. *North Carolina State University, Department of Statistics Seminar, January 7, 2019, Raleigh, NC*

Max-Infinitely Divisible Models for Spatial Extremes Using Random Effects. *Lancaster University, Department of Mathematics and Statistics Seminar, April 13, 2018, Lancaster, LA, United Kingdom*

Max-Infinitely Divisible Models for Spatial Extremes Using Random Effects. *École Polytechnique Fédérale de Lausanne, Statistics Seminar, March 23, 2018, Lausanne, Switzerland*

Hierarchical Scale Mixtures for Flexible Spatial Modeling of Extremes. *Cornell University, Department of Statistical Science Seminar, October 25, 2017, Ithaca, NY*

Hierarchical scale mixtures for flexible spatial modeling of extremes. *Colorado State University, Statistics Department Seminar, March 27, 2017, Fort Collins, CO*

Spatial extreme value analysis for fire risk assessment. *King Abdullah University of Science and Technology, Statistics Program Seminar, November 21, 2016, Thuwal, Saudi Arabia*

Spatial extreme value analysis for fire risk assessment. *University of Connecticut, Department of Statistics Seminar, November 2, 2016, Storrs, CT*

Spatial extreme value analysis for fire risk assessment. *Purdue University Spatial Statistics Seminar, November 30, 2015, West LaFayette, IN*

Spatial extreme value analysis for fire risk assessment. *University of Chicago Spatial Statistics Seminar, November 6, 2015, Chicago, IL*

A three-groups model for high-throughput survival screens. *American University Department of Mathematics Seminar, October 27, 2015, Washington, D.C.*

Downscaling extremes for fire risk assessment. *Joint Statistical Meetings, contributed talk, August 9, 2015, Seattle, WA*

A three-groups model for high-throughput survival screens. *Penn State University Department of Biostatistics Seminar, April 29, 2015, Hershey, PA*

Strategies for using Gaussian processes with large datasets. *Penn State University Department of Astronomy Colloquium, December 10, 2014, University Park, PA*

Model-based empirical orthogonal functions for separating scales of variation. *Penn State University Department of Meteorology Colloquium, March 26, 2014, University Park, PA*

Model-based empirical orthogonal functions for separating scales of variation. *Penn State University Stochastic Modeling and Computing Seminar, November 15, 2013, University Park, PA*

Bayesian spatial extreme value analysis to assess the changing risk of widespread crop failure in Europe. *UC Santa Cruz Statistics and Applied Math Seminar, March 12, 2012, Santa Cruz, CA*

A More Practical Max-Stable Process for Spatial Extremes. *NTNU Statistics Department Seminar, June 7, 2011, Trondheim, Norway*

The Open-faced sandwich adjustment for MCMC using tapered covariances. *Very large datasets working group seminar, Johns Hopkins School of Public Health, May 12, 2010, Baltimore, MD*

What you need to know about (parameter estimation using) covariance tapering. *Computation, Visualization, and Dimension Reduction in Spatio-Temporal Modeling working group, SAMSI, Dec. 11, 2009, Durham, NC*

Covariance tapering for large spatial datasets. *Computer Science departmental seminar, Rensselaer Polytechnic Institute, Nov. 3, 2009, Troy, NY*

Grants Awarded

“Workshop on Risk Analysis for Extremes in the Earth System”

Grant #: DMS-1932751
Agency: National Science Foundation
PI: Benjamin Shaby
Start date: 07/31/19
End date: 08/01/20
Total award: \$13,000

“CAREER: Hierarchical Models for Spatial Extremes”

Grant #: DMS-1752280
Agency: National Science Foundation
PI: Benjamin Shaby
Start date: 07/01/18
End date: 06/30/23
Total award: \$400,000

“Collaborative Research: Combining Heterogeneous Data Sources to Identify Genetic Modifiers of Diseases”

Grant #: DMS-1761903/DMS-1761941
Agency: National Science Foundation
PI: Benjamin Shaby (DMS-1761903) and Steve Finkbeiner (DMS-1761941)
Co-PI: Daisy Philtron
Start date: 07/01/18
End date: 06/30/23
Total award: \$1,000,000

“Projecting Flood Risk from Extreme Precipitation: Interaction Between Climate Change and Urbanization”

Agency: Penn State Institute for Energy and the Environment
PI: Benjamin Shaby
Co-PIs: Alfonso Mejia, Chris Forest
Start date: 04/15/18
End date: 06/30/19
Total award: \$22,636

“Coupled Statistical and Dynamical Models to Project Changing Risk of Extreme Floods due to Climate Change and Urbanization”

Agency: Penn State Institute for CyberScience
PI: Benjamin Shaby
Co-PIs: Alfonso Mejia, Chris Forest
Start date: 05/01/18
End date: 04/30/19
Total award: \$33,462

“Development of non-stationary methods for addressing climate change effects on NOAA Atlas 14 precipitation frequency estimates”

Grant #: Z17-20337
Agency: National Atmospheric and Oceanic Administration
PI: Benjamin Shaby
Co-PI: Alfonso Mejia
Start date: 01/01/17
End date: 12/31/17
Total award: \$114,014

“Workshop on Climate and Weather Extremes”

Grant #: DMS-1651714
Agency: National Science Foundation
PI: Benjamin Shaby
Start date: 09/01/16
End date: 08/31/17
Total award: \$10,000

“SI2-SSI: Integrating the NIMBLE statistical algorithm platform with advanced computational tools and analysis workflows”

Grant #: ACI-1550488
Agency: National Science Foundation
PI: Perry de Valpine
Co-PIs: Benjamin Shaby, Christopher Paciorek, Duncan Temple Lang
Start date: 10/01/16
End date: 09/30/20
Total award: \$1,000,000

“Development of non-stationary methods for addressing climate change effects on NOAA Atlas 14 precipitation frequency estimates”

Grant #: Z16-23485
Agency: National Oceanic and Atmospheric Administration
PIs: Benjamin Shaby and Alfonso Mejia
Start date: 05/10/2016
End date: 08/31/2016
Total award: \$15,000

“Neuron and Glial cellular signatures from normal and diseased iPS cells”

Grant #: U54 NS091046
Agency: National Institutes of Health UCI
PI: Steve Finkbeiner
Start date: 09/30/14
End date: 06/30/20
Total award: \$7,012,028

“Ea SM2: Advancing Extreme Value Analysis of High Impact Climate and Weather Events”

Grant #: DE-AC02-05CH11231
Agency: Department of Energy
PI: Michael Wehner
Start date: 06/30/2014
End date: 06/30/18
Total award: \$2,703,013

“Automated longitudinal single cell analysis”

Grant #: 1R01NS083390-01
Agency: National Institutes of Health
PI: Steve Finkbeiner
Start date: 12/01/2012
End date: 06/30/17
Total award: \$1,638,269

Teaching Experience

Colorado State University, Fort Collins, CO

2019–present

Instructor

Stochastic Processes
Probability with Applications
Probability and Mathematical Statistics I

Penn State University, University Park, PA

2013–2019

Instructor

Stochastic Processes
Statistical Computing
Introduction to Probability Theory
Graduate Topic Course on Spatial Statistics

Duke University, Durham, NC

2011

Instructor

Probability and Statistical Inference

Advising

Ph.D. Students

Gregory Bopp, Statistics (2019)
Mauricio Nascimento, Statistics (2020)
Dhanushi Wijeyakulasuriya, Statistics (2020, joint with Ephraim Hanks)
Likun Zhang, Statistics (2020)

M.S. Students

John Ensley, Statistics (2017)

Ph.D. Committee

Nikolay Balashov, Meteorology
Sheila Trampush, Geosciences
Jaewoo Park, Statistics
Meridith Bartley, Statistics
Amy Zhang, Statistics
Yangqingxiang Wu, Mathematics
Benjamin Sheng, Statistics
Hillary Koch, Statistics
Nathan Wikle, Statistics
Nehali Mhatre, Statistics

M.S. Committee

Pavithra Govardhanan, Computer Science

Professional Affiliations

The International Environmetrics Society
 American Statistical Association
 Institute of Mathematical Statistics
 International Society for Bayesian Analysis
 American Geophysical Union
 International Biometric Society

Service

Elected Positions

Section on Environmental Sciences, International Society for Bayesian Analysis

Chair Elect 2020–2021

Program Chair 2018–2019

Professional Conferences

Workshop on Risk Analysis for Extremes in the Earth System

Co-chair of organizing committee July, 2019

The STATMOS Workshop on Climate and Weather Extremes

Chair of organizing committee October, 2016

Joint Statistical Meetings

Organized invited session “*Bayesian Analysis for Extreme Values*” August, 2014

Editorial Service

Associate Editor for *Biometrics* October, 2018–present

Refereed manuscripts for:

Journal of the American Statistical Association
Annals of Applied Statistics
Environmental and Ecological Statistics
Environmetrics
Journal of Computational and Graphical Statistics
Journal of the Royal Statistical Society (Series C)
Journal of the Royal Statistical Society (Series A)
Statistics and Computing
Journal of Geophysical Research – Atmospheres
Journal of Multivariate Analysis
Statistica Sinica
Journal of Agricultural, Biological, and Environmental Statistics
WIREs Computational Statistics
Climatic Change

Journal of Climate
Nature
Forests
Proceedings of the Royal Academy
Statistical Science
Advances in Statistical Climatology, Meteorology, and Oceanography

Other Service:

Judged student paper competition for ASA Section on Bayesian Statistical Science 2015, 2021

Service to the Department:

Computing Committee, CSU	2020–2021
Ph.D. Admissions Committee, CSU	2020–2021
Chair of Data Science Committee, CSU	2020–2021
Graduate Committee, CSU	2019–2021
Chair of Ph.D. Admissions Committee, PSU	2018–2019
Faculty Search Committee, PSU	2014–2015, 2016–2017, 2018–2019
Chair of Ph.D. Qualifying Exam Committee, PSU	2016

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