Murali Haran

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Education

PhD (2003), Statistics, University of Minnesota, Minneapolis.
Advisors: Professors Luke Tierney and Bradley P. Carlin
Thesis title: Efficient Perfect and MCMC Sampling Methods for Bayesian Spatial and Components of Variance Models.

MS (2001), Statistics, University of Minnesota, Minneapolis.

BS (1997), Computer Science (minors in Mathematics, Statistics and Film), Carnegie Mellon University, Pittsburgh.

Employment

Head, Department of Statistics, Pennsylvania State University. July 2018–
Professor of Statistics, Pennsylvania State University. July 2016–
Associate Professor of Statistics, Pennsylvania State University. 2010–2016.
Visiting Associate Professor of Statistics, University of Washington, Seattle. 2011–2012.
New Research Fellow, Statistical and Applied Mathematical Sciences Institute (SAMSI), North Carolina. September 2009–December 2009.
Assistant Professor of Statistics, Pennsylvania State University. 2004–2010.
Postdoctoral Fellow, National Institute of Statistical Sciences (NISS), North Carolina. 2003–2004.

Awards/Honors

Elected Member of the International Statistics Institue (ISI), 2017.

Fellow of the American Statistical Association, 2016.

2015 Abdel El-Shaarawi Young Researcher (AEYR) Award given by The International Environmetrics Society to "recognize and honor outstanding contributions to the field of environmetrics".

2014 Young Investigator Award given by the American Statistical Association (ASA) Section on Statistics and the Environment (ENVR), to a researcher under 40 years of age for contributions to statistical methods for environmental science.

Outstanding Poster Award, "Case Studies in Bayesian Statistics" conference. Pittsburgh. 2007.

Young Investigator Travel Award to IMS-ISBA Meeting, Bormio, Italy. 2005.

Student Service Award, Statistics, University of Minnesota. 2003.

School of Computer Science Honors, Carnegie Mellon University. May 1997.

Inducted into Lambda Sigma National Honor Society. 1994.

Publications * indicates advisee

Lee, B.S.*, and Haran, M. (2021+) "PICAR: An Efficient Extendable Approach for Fitting Hierarchical Spatial Models," *Technometrics* (to appear).

Lee, B.S.*, Haran, M., Fuller, R.W., Pollard, D., and Keller, K. (2020) A Fast Particle-Based Approach for Calibrating a 3-D Model of the Antarctic Ice Sheet, *Annals of Applied Statistics*, 14, 2, 605-634.

Kelling, C.*, Korkmaz, G., Graif, C., and Haran, M. (2020) "Combining Geographic and Social Proximity to Model Urban Domestic and Sexual Violence," *Journal of Quantitative Criminology*, 1-36.

Park, J.* and Haran, M. (2020) "A Function Emulation Approach for Intractable Distributions," *Journal of Computational and Graphical Statistics*, 29(1), 66-77.

Park, J.*, and Haran, M. (2020) Reduced-dimensional Monte Carlo Maximum Likelihood for Latent Gaussian Random Field Models, *Journal of Computational and Graphical Statistics*, 1-15.

Paulson, J. N., Williams, B. L., Hehnly, C., Mishra, N., Sinnar, S. A., Zhang, L., ... and Schiff, S. J. (2020) "The Bacterial and Viral Complexity of Infant Postinfectious Hydrocephalus in Uganda," *Science Translational Medicine*, 12(563).

Guan, Y.*, Sampson, C., Tucker, J.D., Chang, W., Mondal, A., Haran, M., and Sulsky, D. (2019) Computer model calibration based on image warping metrics: an application for sea ice deformation, to appear in the *Journal of Agricultural, Biological, and Environmental Statistics.*

Goldstein*, J., Park, J.*, Haran, M, Bjornstad, O., Liebhold, A. (2019) "Quantifying spatio-temporal variation of invasion spread," *Proceedings of the Royal Society (B)*, 286, 1894

R. Olson, K. L. Ruckert, W. Chang, K. Keller, M. Haran, and S.-I. An (2019) "Stilt: easy emulation of AR(1) computer model output in multidimensional parameter space," *The R Journal*, 10(2), 209-225.

Reich, B.J., and Haran, M. (2018) "Precision maps for public health," *Nature News and Views*. February 2018.

Park, J.* and Haran, M. (2018) "Bayesian Inference in the Presence of Intractable Normalizing Functions," *Journal of the American Statistical Association*, 113, 523, 1372-1390.

Guan*, Y. and Haran, M. (2018) "A Computationally Efficient Projection-Based Ap-

proach for Spatial Generalized Linear Mixed Models," *Journal of Computational and Graphical Statistics*, 27:4, 701-714.

Russell, J.*, Hanks, E.M., Haran, M., and Hughes, D.P. (2018) "A Spatially-Varying Stochastic Differential Equation Model for Animal Movement," *Annals of Applied Statistics*, 12(2):1312-1331.

Craigmile, P.F., Haran, M., Li, B., Mannshardt, E., Rajaratnam, B., and Tingley, M. (2018) "Paleoclimate reconstruction: looking backwards to look forward," in *Handbook of Environmental and Ecological Statistics*, Chapman and Hall/CRC, New York (edited volume, peer-reviewed).

Park, J.*, Goldstein, J., Haran, M., and Ferrari, M. (2017) "An Ensemble Approach to Predicting the Impact of Vaccination on Rotavirus Disease in Niger," *Vaccine*, 35, 43, pp 5731-5946.

Haran, M., Chang, W., Keller, K., Nicholas, R., and Pollard, D. (2017) Statistics and the Future of the Antarctic Ice Sheet, *Chance*, 30, 4, 37-44.

Lee, B.S.*, Haran, M., and Keller, K. (2017) "Multi-decadal scale detection time for potentially increasing Atlantic storm surges in a warming climate", *Geophysical Research Letters*, 44, 20, pp 10,617-10,623

Guan, Y.*, Haran, M., and Pollard, D. (2017) "Inferring Ice Thickness from a Glacier Dynamics Model and Multiple Surface Datasets," *Environmetrics*.

Chang, W.*, Haran, M., Applegate, P. and Pollard, D. (2016) "Improving Ice Sheet Model Calibration Using Paleoclimate and Modern Data," *Annals of Applied Statistics*, 10, 4, 2274–2302.

Pollard, D., Chang, W.*, Haran, M., Applegate, P., and DeConto, R. (2016) "Large ensemble modeling of last deglacial retreat of the West Antarctic Ice Sheet: Comparison of simple and advanced statistical techniques," *Geoscientific Model Development*, 9, 1697-1723.

Chang, W.*, Haran, M., Applegate, P., and Pollard, D. (2016) "Calibrating an ice sheet model using high-dimensional binary spatial data," *Journal of the American Statistical Association*, 111 (513), 57-72.

Russell, J.*, Hanks, E.M., and Haran, M. (2016), "Dynamic Models of Animal Movement with Spatial Point Process Interactions," *Journal of Agricultural, Biological and Environmental Statistics*, 21(1):22-40.

Tingley, M., Craigmile, P.F., Haran, M., Li, B., Mannshardt-Shamseldin, E. and Rajaratnam, B. (2015), "On discriminating between GCM forcing configurations using Bayesian

reconstructions of Late-Holocene temperatures," *Journal of Climate*, 28, 8264–8281.

Chang, W.*, Haran, M., Olson, R., and Keller, K. (2015) "A composite likelihood approach to computer model calibration with high-dimensional spatial data," *Statistica Sinica*, 25, 243-259.

Goldstein, J.*, Haran, M., Simeonov, I., Fricks, J., and Chiaromonte, F. (2015) "An attraction-repulsion point process model for respiratory syncytial virus infections," *Biometrics*, 71, 2, 376–385. (Winner of best poster prize at the Graybill/ENVR 2014 Conference on Modern Statistical Methods for Ecology, Fort Collins, Colorado).

Chang, W.*, Applegate, P., Haran, M. and Keller, K. (2014) "Probabilistic calibration of a Greenland Ice Sheet model using spatially-resolved synthetic observations: toward projections of ice mass loss with uncertainties," *Geoscientific Model Development Discussion, 7, 1905-1931.*

Tibbits, M.M.*, Groendyke, C., Haran, M. and Liechty, J.C. (2014), "Automated factor slice sampling," *Journal of Computational and Graphical Statistics*, 23, 2, pp. 543-563.

Chang, W.*, Haran, M., Olson, R., and Keller, K. (2014) "Fast dimension-reduced climate model calibration and the effect of data aggregation," *Annals of Applied Statistics*, 8, 2, pp. 649–673. (Winner of the Best Paper Award for 2014 from the American Statistical Association's Section on Statistics and Environment)

Jandarov, R.*, Haran, M., Bjornstad, O.N., and Grenfell (2014) "Emulating a gravity model to infer the spatiotemporal dynamics of an infectious disease," *Journal of the Royal Statistical Society Series C*, 63, 3, pp. 423–444.

Katz, R.W., Craigmile, P.F., Guttorp, P., Haran, M., Sanso, B. and Stein, M.L. (2013) "Uncertainty Analysis in Climate Change Assessments," *Nature Climate Change*, 3, 769–771.

Hughes, J.* and Haran, M. (2013) "Dimension Reduction and Alleviation of Confounding for Spatial Generalized Linear Mixed Models," *Journal of the Royal Statistical Society Series B*, 75, 1, 139–159.

Olson, R., Sriver, R., Goes, M., Urban, N.M., Matthews, H.D., Haran, M., and Keller, K. (2013) "A climate sensitivity estimate using Bayesian fusion of instrumental observations and an Earth System model," *Journal of Geophysical Research - Atmospheres*, 118 (10), 4348-4358117, D4.

Olson, R., Sriver, R., Haran, M., Chang, W., Urban, N.M., Keller, K. (2012) "Uncertainty in climate sensitivity estimates due to random realizations of unresolved climate noise," *Journal of Geophysical Research - Atmospheres*, VOL. 117, D04103.

Bhat, K.S.*, Haran, M., Olson, R., and Keller,K. (2012) "Inferring likelihoods and climate system characteristics from climate models and multiple tracers," *Environmetrics*, 23, 4, pp. 345–362. (Winner of a 2010 student paper award from the Section on Bayesian Statistical Sciences.)

Jandarov, R.*, Haran, M., and Ferrari, M. (2012) "A Compartmental Model for Meningitis: Separating Transmission from Climate Effects on Disease Incidence," *Journal of Agricultural, Biological and Environmental Statistics*, 17, 3, pp. 395-416.

Tingley, M., Craigmile, P.F., Haran, M., Li, B., Mannshardt-Shamseldin, E. and Rajaratnam, B. (2012), "Piecing together the past: Statistical insights into paleoclimatic reconstructions," *Quaternary Science Reviews*, 35, 1–22.

Recta, V.*, Haran, M. and Rosenberger, J.L. (2012) "A two-stage model for incidence and prevalence in point-level spatial count data," *Environmetrics*, 23, 2, 162–174.

Tibbits, M. M.*, Haran, M., and Liechty, J.C. (2011) "Parallel multivariate slice sampling," *Statistics and Computing*, **21**, 3, 415–430.

Bhat, K.S.*, Haran, M., Terando, A.J. and Keller, K. (2011) "Climate Projections Using Bayesian Model Averaging and Space-Time Dependence," *Journal of Agricultural, Biological and Environmental Statistics*, **16**, 4, pp. 606–628.

Yang, T.*, Jensen, L., and Haran, M. (2011) "Does social capital save lives? Explaining the rural paradox with county-level mortalitydata," *Rural Sociology*, 76(3), pp. 347–374.

Haran, M. (2011) "Gaussian random field models for spatial data," in *Handbook of Markov chain Monte Carlo*, Editors, Brooks, S.P., Gelman, A.E. Jones, G.L. and Meng, X.L., Chapman and Hall/CRC, pp 449–473.

Hughes, J.P.*, Haran, M., and Caragea, P.C. (2011) "Autologistic models for binary data on a lattice," *Environmetrics*, **22**, 7, 857–871.

Goes, M., Urban, N., Olson, R., Haran, M., and Keller, K. (2010) ""What is the skill of ocean tracers in reducing uncertainties about ocean diapycnal mixing and projections of the Atlantic Meridional Overturning Circulation?" *Journal of Geophysical Research – Oceans*, **115**, C12006, 12 pp. `doi:10.1029/2010JC006407`.

Bhat, K.S.*, Haran, M., and Goes, M. (2010) "Computer model calibration with multivariate spatial output," in *Frontiers of Statistical Decision Making and Bayesian Analysis*, 168–184, Editors, M-H. Chen, D.K. Dey, P. Mueller, D. Sun, and K. Ye, New York: Springer-Verlag, 2010.

Haran, M., Bhat, K.S.*, Molineros, J., De Wolf, E. (2010) "Estimating the risk of a crop epidemic from coincident spatiotemporal processes," *Journal of Agricultural, Bio-*

logical and Environmental Statistics, 1085-7117.

Yang, T.*, Teng, H., and Haran, M. (2009) "The impacts of social capital on infant mortalities in the U.S.: a spatial investigation," *Applied Spatial Analysis and Policy*, **2**, 3, 211–227.

Yang, T.*, Jensen, L., and Haran, M. (2008) "Context and death: A spatial investigation of the impacts of social capital and natural amenities on mortality in the U.S. counties," (refereed discussion paper) *Proceedings of the Population Association of America* (41 pages; published online: `http://paa2008.princeton.edu/download.aspx?submissionId=81160`).

Flegal, J.M., Haran, M. and Jones, G.L. (2008) "Markov chain Monte Carlo: can we trust the third significant figure?" *Statistical Science*, **23**, 250–260.

Haran, M., Karr, A.F., Last, M., Orso, A., Porter, A., Sanil, A.P. and Fouche, S. (2007) "Techniques for classifying executions of deployed software to support software engineering tasks," *IEEE Transactions on Software Engineering*, **33,5**, 287–304.

Jones, G.L., Haran, M., Caffo, B.S. and Neath, R. (2006) "Fixed width output analysis for Markov chain Monte Carlo," *Journal of the American Statistical Association*, **101**, 1537–1547.

Haran, M., Karr, A.F., Orso, A., Porter, A. and Sanil, A.P. (2005) "Applying classification techniques to remotely-collected program execution data," (refereed proceedings) *Proceedings of the Joint 10th European Software Engineering Conference and 13th ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC/FSE 2005)*, 146–155.

Haran, M., Hodges, J.S., and Carlin, B.P. (2003) "Accelerating computation in Markov random field models for spatial data via structured MCMC," *Journal of Computational and Graphical Statistics*, **12**, 249-264.

Haran, M., Carlin, B.P., Adgate, J.L., Ramachandran, G., Waller, L.A., and Gelfand, A.E. (2002) "Hierarchical Bayes models for relating particulate matter exposure measures," Case Studies in Bayesian Statistics, Volume VI, eds. C.Gatsonis, et al., New York: Springer-Verlag, 2002, pp. 239–254.

Manuscripts Under Review

Guan, Y.*, and Haran, M. (2019) Fast expectation-maximization algorithms for spatial generalized linear mixed models, under review.

Chang, W.*, Konomi, B. A., Karagiannis, G., Guan, Y., Haran, M. (2019) Ice model calibration using semi-continuous spatial data, submitted to the *Annals of Applied Statistics*.

Other Manuscripts

Haran, M., R. Nicholas, and K. Keller (2013)"The Role of Statistics in Sustainability Research," Essay Contribution for Math Awareness Month.

Bao, L., Fricks, J., and Haran, M. (2012) "Comment: Bayesian Spatio-Dynamic Modeling in Cell Motility Studies: Learning Nonlinear Taxic Fields Guiding Immune Response," *Journal of the American Statistical Association*, 107, 499, pp. 869-871.

Haran, M. and Urban, N. (2011) Discussion of McShane and Wyner "A statistical analysis of multiple temperature proxies: are reconstructions of surface temperaturesover the last 1000 years reliable?" invited discussion for the *Annals of Applied Statistics*, **5**, 1, 61–65.

Haran, M. and Tierney, L. (2012) "On automating Markov chain Monte Carlo for a class of spatial models," *arxiv.org*

Haran, M., Karr, A.F, and Sanil, A.P. (2004) "A Model for Relating Browsing Behavior to Site Design on the World Wide Web," *Proceedings of the Joint Statistical Meetings, Statistical Computing Section.*

Invited Talks

"Projection-based Methods for Hierarchical Spatial Models," Big Data Institute, Oxford University, Oxford, UK. September 2019.

"Projection-based Methods for Hierarchical Spatial Models," GEOMED (spatial statistics, geographical epidemiology and geographical aspects of public health) meeting, Glasgow, Scotland, August 2019.

"Quantifying SpatioTemporal Variation of Invasion Spread," MIDAS meeting, Atlanta, Georgia. April 2019.

"A Particle-Based Approach for Computer Model Calibration," Joint Statistical Meetings, Vancouver. August 2018.

"Modeling and Inference for Rotavirus Dynamics in Niger," International Society for Bayesian Analysis, Edinburgh, Scotland. June 2018.

"Fast Inference for Spatial Generalized LinearMixed Models," Microsoft Distinguished Lecture, University of Washington, Seattle, Washington. May 2018.

"Overview of Ice Dynamics Working Group," Transition Workshop for Program on Mathematical and Statistical Methods for Climate and the Earth System (CLIM), Statistical and Applied Mathematical Sciences Institute (SAMSI), Durham, North Carolina. May 2018.

Discussion of "Representative Points for Small and Big Data Problems", Transition Workshop for Program on Quasi-Monte Carlo, Statistical and Applied Mathematical

Sciences Institute (SAMSI), Durham, North Carolina. May 2018.

"Spatial Statistics, Deterministic Models, and the Future of the Antarctic Ice Sheet," Fields Institue, Toronto, Ontaria, Canada. April 2018.

"Inference in the presence of intractable normalizing functions," Monte Carlo, Statistics, and So Much More: Conference in Honor of Charlie Geyer, Minneapolis, Minnesota. April 2018.

"Inference in the presence of intractable normalizing functions," North Carolina State University, Raleigh, North Carolina. March 2018.

"A projection-based approach for spatial generalized linear mixed models," BIRS Conference, Banff, Canada. December 2017.

"A projection-based approach for spatial generalized linear mixed models," BIRS Conference, Oaxaca, Mexico. November 2017.

"A dimension-reduced approach to modeling non-Gaussian spatial data," SAS Institute, Cary, North Carolina. October 2017.

"A projection-based approach for spatial generalized linear mixed models," Department of Statistics, Duke University, Durham, North Carolina. October 2017.

"A projection-based approach for spatial generalized linear mixed models," Department of Statistics, North Carolina State University, Raleigh, North Carolina. October 2017.

"Statistical Methods for Studying the West Antarctic Ice Sheet," Department of Mathematics, University of Split, September 2017.

International Conference on Software, Telecommunications and Computer Networks, Softcom 2017, Split, Croatia.

"Statistical Methods for Studying the West Antarctic Ice Sheet," Environmental Seminar, North Carolina State University, September 2017.

"Statistical Problems in Ice Dynamics," Statistical and Applied Mathematical Sciences Institute (SAMSI) , Durham, North Carolina. August 2017.

"Combining a glacier dynamics model with multiple surface datasets," Meeting of the The International Environmetrics Society (TIES), Bergamo, Italy. July 2017.

"Computer Model Calibration for Studying the West Antarctic Ice Sheet," Meeting of the International Statistical Institute (ISI), Marrakech, Morocco. July 2017.

"A projection-based inferential approach for spatial generalized linear mixed models," Purdue University, West Lafayette, Indiana. April 2017.

"Statistical Methods for Studying the West Antarctic Ice Sheet," Arizona State University, Tempe, Arizona. March 2017.

"Statistical Methods for Studying the West Antarctic Ice Sheet," King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia. March 2017.

"Computer Models, Spatial Statistics, and the West Antarctic Ice Sheet," Department of Applied and Computational Mathematics and Statistics, University of Kentucky, Lexington, Kentucky. October 2016.

"Computer Models, Spatial Statistics, and the West Antarctic Ice Sheet," Department of Applied and Computational Mathematics and Statistics, Notre Dame University, South Bend, Indiana. October 2016.

"Statistical Methods for Studying the West Antarctic Ice Sheet," Joint Statistical Meetings, Chicago, Illinois. August 2016.

"Statistical Methods for Studying the West Antarctic Ice Sheet," International Society for Bayesian Analysis Meeting (ISBA), Sardinia, Italy. June 2016.

"Statistical Methods for Studying Ice Sheets," Department of Statistics, Colorado State University, Fort Collins, CO. April 2016.

"Statistical Methods for Studying Ice Sheets," Department of Statistics, Yale University, New Haven, CT. April 2016.

"Statistical Methods for Studying Ice Sheets," Department of Statistics, Brigham Young University, UT. February 2016.

"Toward Efficient MCMC for Some High-dimensional Latent Variable Models," Bayes Computing at MCMSki V, Lenzerheide, Switzerland. January 2016.

"An attraction-repulsion spatial point process model for respiratory virus infections concentrations," TIES, The International Environmetrics Society. November 2015.

"Quantifying Spatio-temporal Variation of Invasion Spread," Conference on Geomedical Systems (GEOMED 2015), Florence, Italy. September 2015.

"Toward Efficient Inference for High-dimensional Latent Variable Models," Joint Statistical Meetings, Seattle, WA. August 2015.

"Ice Sheet Model Calibration with Spatial Data," Alan Gelfand's 70th Birthday Confer-

ence, Durham, NC. April 2015.

"Spatial Local Gradient Models of Biological Invasions," Eastern North American Region (ENAR) Statistical Meeting, Miami, Florida. March 2015.

"Dimension reduction and alleviation of confounding in spatial generalized linear mixed models," Department of Statistics, Peking University, Beijing, China. December 2014.

"Toward Ice Sheet Model Calibration with Spatial Data," The International Environmetrics Society (TIES) Meeting, Guangzhou, China. December 2014.

"Toward Ice Sheet Model Calibration with Spatial Data," Ohio State University, Columbus, Ohio. November 2014.

"Approximating and Calibrating a Computer Model with Spatial Output", INFORMS (Institute for Operations Research and the Management Sciences) meeting, San Francisco, CA. November 2014.

"Parameter inference for computer models with high-dimensional spatial output," III Forum Mineiro de Statistics and Probability 2014, Belo Horizonte, Minais Gerais, Brazil. August 2014.

"Dimension reduction and alleviation of confounding in spatial generalized linear mixed models," Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil. August 2014.

"Combining High-dimensional Data from Climate Models and Observations to Sharpen Climate Projections," SIAM Uncertainty Quantification Workshop, Savannah, Georgia. April 2014.

"An attraction-repulsion point process model for respiratory syncytial virus infections," Eastern North American Region (ENAR) Statistical Meeting, Baltimore, Maryland. March 2014.

"Dimension reduction and alleviation of confounding in spatial generalized linear mixed models," Department of Mathematics and Statistics, Case Western University, Cleveland, Ohio. November 2013.

"Latent variable compartmental models for infectious diseases," Joint Statistical Meetings, Montreal, Canada. August 2013.

"Inference with implicit likelihoods," Conference on Bayesian Inference for Stochastic Processes (BISP-8), Milan, Italy. June 2013.

"Dimension reduction and alleviation of confounding in spatial generalized linear mixed models," Department of Statistics, Trinity College, Dublin, Milan. May 2013.

"Inference for computationally intensive space-time infectious disease models," Department of Biostatistics, Hershey Medical School, Penn State University, PA. April 2013.

"Inference with implicit likelihoods and high-dimensional data," Department of Statistics, Fox School of Business, Temple University, Philadelphia, PA. April 2013.

"Dimension reduction and alleviation of confounding in spatial generalized linear mixed models," Department of Statistics, Texas A & M University, College Station, TX. March 2013.

"Using models and data to learn about the future of the climate," American Association for the Advancement of Science (AAAS) Annual Meeting, Boston, MA. February 2013.

"Climate model calibration," Department of Biostatistics, University of Minnesota, MN. November 2012.

"Computer model calibration with high-dimensional spatial data," Joint Statistical Meetings, San Diego, CA. July 2012.

"Computer model calibration with high-dimensional spatial observations," Institute of Mathematical Statistics Asia Pacific Rim Meeting (IMS-APRM), Tsukuba, Japan. July 2012.

"Computer model calibration with high-dimensional multivariate spatial observations," International Society for Bayesian Analysis Meeting (ISBA), Kyoto, Japan. July 2012.

"Dimension reduction and alleviation of confounding in spatial generalized linear mixed models," The 8th Purdue Statistics Symposium, West Lafayette, IN. June 2012

"Inference with implicit likelihoods for infectious disease and climate science," Department of Statistics, University of British Columbia, BC. Canada. February 2012.

"Gaussian processes for inference with implicit likelihoods," Microsoft Research, Redmond, WA. January 2012.

"Inference with implicit likelihoods for infectious disease," Applied, Bayesian, and Computational Statistics Research Group, University of Washington, Seattle, WA. January 2012.

"Automating MCMC algorithms, alleviating confounding, and reducing dimensions for a class of spatial models," Department of Statistics, University of California-Santa Cruz, CA. January 2012.

"Automating MCMC algorithms, alleviating confounding, and reducing dimensions for a class of spatial models," Department of Statistics, University of Missouri, Columbia, MO. December 2011.

"Automating MCMC algorithms, alleviating confounding, and reducing dimensions for a class of spatial models," Department of Statistics, University of Washington, Seattle, WA. October 2011.

"Emulating a gravity model to infer the spatiotemporal dynamics of an infectious disease," Conference on Geomedical Systems (GEOMED 2011), Victoria, British Columbia, Canada. October 2011.

"Gaussian processes for inference with implicit likelihoods," Rao Prize Conference, Penn State University. May 2011.

"Gaussian processes for inference with implicit likelihoods," University of Minnesota 40th Anniversary Conference, Minneapolis, MN. May 2011.

"Gaussian processes for inference with implicit likelihoods," The Fourth Erich L. Lehmann Symposium, Rice University, Houston, TX. May 2011.

"Dimension reduction and alleviation of spatial confounding for spatial generalized linear mixed models," Workshop on Environmetrics, National Center for Atmospheric Research, Boulder, Colorado. October 2010.

"Interaction of deterministic and stochastic models," SAMSI Spatial Program Transition Workshop, Durham, North Carolina. October 2010.

"Towards automated MCMC algorithms for a class of Gaussian random field models" Lawrence Livermore National Laboratories, Livermore, California. July 2010.

"On Gaussian process models for learning about climate model parameters," TIES, The International Environmetrics Society, Margarita Island, Venezuela. June 2010.

"Towards automated MCMC algorithms for a class of Gaussian random field models," University of Valencia, Valencia, Spain. June 2010.

"Towards automated MCMC algorithms for a class of spatial models," Los Alamos National Laboratories, Los Alamos, New Mexico. May 2010.

"Inferring likelihoods and climate system characteristics from climate models and multiple tracers," Western Michigan University. March 2010.

"Inferring likelihoods and climate system characteristics from climate models and multiple tracers," Frontiers of Interface between Statistics and Sciences, University of Hy-

derabad, India. December 2009.

"A statistical approach to projecting future climate," National Institute of Environmental Health Sciences, Durham, North Carolina. December 2009.

"Rigorous strategies for automating Markov chain Monte Carlo," North Carolina State University, Raleigh, North Carolina. November 2009.

"Emulating a gravity model to infer the spatiotemporal dynamics of an infectious disease," Conference on Geomedical Systems, Charleston, South Carolina. November 2009.

"Automating Markov chain Monte Carlo," Duke University. October 2009.

"Efficient methods for the analysis of spatial data: computing and application," Joint Statistical Meetings, Washington DC. August 2009.

"Inferring likelihoods and climate system characteristics from climate models and multivariate tracer data," Virginia Tech, Blacksburg, VA. April 2009.

"Inferring likelihoods and climate system characteristics from climate models and multivariate tracer data," George Washington University, Washington DC. April 2009.

"Towards automating MCMC algorithms for spatial generalized linear models," University of Texas M.D.Anderson Cancer Center, Houston, TX. March 2009.

"Inferring likelihoods and climate system characteristics from climate models and spatiotemporal tracer data," Iowa State University Department of Statistics, Ames, Iowa. September 2008.

"Inferring likelihoods and climate system characteristics from climate models and spatiotemporal tracer data," University of Iowa, Iowa City, Iowa. September 2008.

"Towards automating Markov chain Monte Carlo," Industrial Engineering and Operations Research, Penn State University. November 2007.

"Exact and approximate Monte Carlo for spatial models," DIMACS (Discrete Mathematics and Theoretical Computer Science) Workshop on Markov Chain Monte Carlo, Rutgers University, New Jersey. June 2007.

"Experiments with Monte Carlo for spatial models," Third Workshop on Monte Carlo Methods, Harvard University, Boston. May 2007.

"Monte Carlo for a class of spatial models," Computational Science Invited Lectures, Department of Aerospace Engineering, Penn State University. April 2007.

"Crop disease: Estimating the risk of an FHB epidemic," Johns Hopkins University School of Public Health, Baltimore. January 2007.

"Crop disease epidemics: The risk of a perfect (FHB) storm," Department of Ecology, Penn State University. October 2006.

"Modeling the risk of wheat crop disease," Joint Statistical Meetings, Seattle. August 2006.

"Large scale crop disease forecasting: A case study of Fusarium Head Blight," 7th Annual International Conference and Workshop on Digital Government Research, San Diego, CA. May 2006.

"Hotspot detection analysis motivated by large scale plant disease forecasting," Workshop on early monitoring and sustainable management, Department of Environmental Sciences, Parma University, Italy. March 2006.

"New Monte Carlo strategies with applications to spatial models," Department of Statistics, George Washington University. February 2006.

"Monte Carlo for a Bayesian spatial model: some practical issues," Los Alamos National Laboratories, New Mexico. October 2004.

"Instrumenting software to predict failure," ASA Conference on Quality and Productivity, Raleigh, North Carolina. May 2004.

"Perfect sampling for a Bayesian spatial model," Duke University. January 2004.

"Exact sampling algorithms for disease mapping," Department of Biostatistics, Johns Hopkins University; Statistics Department, Ohio State University; Department of Statistics, Penn State University; National Institute of Statistical Sciences, North Carolina; Department of Biostatistics, Harvard University; Department of Statistics, Cornell University. January/February 2003.

Contributed Presentations

"Emulating a gravity model to infer the spatiotemporal dynamics of an infectious disease," NIMBioS Investigative Workshop Interface Disease Models, University of Tennessee, Knoxville, TN. March 2014.

"Dimension Reduction and Alleviation of Spatial Confounding for Spatial Generalized Linear Mixed Models," Joint Statistical Meetings, Miami Beach, FL. August 2011.

"'Emulating a gravity model to infer the spatiotemporal dynamics of an infectious disease," Joint Statistical Meetings, Vancouver, Canada. August 2010.

"Statistical models for environmental science and climate change research," Statistical

and Applied Mathematical Sciences (SAMSI) undergraduate workshop on space-time models, Durham, North Carolina. October 2009.

"Partially automated Markov chain Monte Carlo for spatial models," Joint Statistical Meetings, Denver. August 2008.

"Nearly automated Monte Carlo for Gaussian random field models," Poster, International Society of Bayesian Analysis (ISBA) Conference, Hamilton Island, Australia. July 2008.

"Estimating the risk of a crop epidemic from coincident spatiotemporal processes," Poster (winner of "Outstanding Poster" award) at Case Studies in Bayesian Statistics workshop, Carnegie Mellon University. October 2007.

"Estimating the risk of a crop epidemic from coincident spatiotemporal processes," 32nd Spring Lecture Series: Spatial and Spatio-Temporal Statistics, University of Arkansas, Fayetteville. April 2007.

"Spatial modeling, computation and crop disease epidemiology," Alumni Workshop, Penn State Statistics Department. March 2007.

"Monte Carlo for spatial models: issues and methods," New Researchers Conference, Minneapolis. August 2005.

"An approximation technique with applications to Monte Carlo methods," Joint Statistical Meetings, Minneapolis. August 2005.

"Exact sampling for two Bayesian models," Poster, IMS-ISBA Meeting on Markov chain Monte Carlo, Bormio, Italy. January 2005.

"A Bayesian model for relating browsing behavior to site structure on the World Wide Web," Joint Statistical Meetings, Toronto, Canada. August 2004.

"Probabilistic modeling of user behavior on the World Wide Web," Poster, International Society of Bayesian Analysis (ISBA) Conference, Vina del Mar, Chile. May 2004.

"Towards independent sampling for Bayesian disease mapping," Joint Statistical Meetings Section on Statistical Computing, New York City. August 2002; Poster, Valencia Meeting on Bayesian Statistics, Tenerife, Spain. June 2002; Poster, First Cape Cod Workshop on Monte Carlo Methods, Cape Cod. September 2002; Poster, Stochastic Computation Workshop, S.A.M.S.I.,North Carolina. October 2002.

"Hierarchical Bayes models for relating particular matter exposure measures," Poster, Workshop on Case Studies in Bayesian Statistics, Pittsburgh. September 2001.

"Accelerating computation for spatial models via structured MCMC," Joint Statistical Meetings, Atlanta. August 2001.

Research Grants

Principal Investigator, National Institutes of Health (NIH)-MIDAS (sub-award from Georgetown University), "Harnessing big data to understand the causes and consequences of vaccine refusal for childhood infectious diseases," $214,000. 9/16/2017–6/30/2021.

Co-Investigator, National Science Foundation (NSF) US-UK Collaboration: "Adaptive surveillance and control for the elimination of endemic disease," $1,699,296, 9/1/2019 – 8/31/2024.

Co-Investigator, National Institutes of Health (NIH) "Predictive Personalized Public Health (P3H): A Novel Paradigm to Treat Infectious Disease," $3,133,805, 9/05/2018 – 8/31/2020.

Investigator, Cooperative Research Agreement, U.S. Department of Energy, Office of Science, Program on Coupled Human and Earth Systems (PCHES) $5,803,804. 8/1/2016 – 7/31/2020.

Principal Investigator, National Science Foundation (NSF-CDS&E, Computational and Data Enabled Science and Engineering), "Statistical Methods for Ice Sheet Projections using Large Non-Gaussian Space-time Data Sets and Complex Computer Models," $500,500, 8/01/2014–7/31/2017.

Investigator, National Science Foundation (NSF-SRN, Sustainable Research Network) "Sustainable Climate Risk Management" (PI K. Keller, Geosciences). (total: $12,000,000). 9/30/2012–9/30/2017. Multi-institution grant; *Co-leader of Uncertainty Quantification and Earth System Models Group supporting 3 Ph.D. students in Statistics, and graduate students, postdoctoral fellows and undergraduates in Statistics, Geosciences, Meteorology.*

Co-Principal Investigator, National Oceanic and Atmospheric Administration (NOAA) prime, Smithsonian Environmental Research Center "Predicting impacts of stressors at the land-water interface" (PI: D. Wardrop) $216,654, 9/1/2009–8/31/2014. (Extension through 8/31/2015).

Investigator, National Science Foundation (NSF-SES, Social and Economic Sciences) "Informing climate-related decisions with Earth system models" (subcontract from RAND, PI K. Keller, Geosciences). $140,000 subcontract (total: $1,300,000). 3/01/2011–2/28/2014.

Investigator, National Science Foundation "Targeted Math Science Partnership: Middle Grades Earth and Space Science Education" (PI Tanya Furman, Geosciences). $9,181,723, 3/1/10–2/28/15.

Principal Investigator, US Geological Survey "Developing regionally downscaled probabilistic climate change projections." $155,000, 7/1/2009–12/1/2010.

Co-Principal Investigator, Bill and Melinda Gates Foundation Grant "Evaluate candidate vaccine technologies using computational models." (PI: Ottar Bjornstad) $2,871,465, 1/1/2008–12/31/2011.

Co-Principal Investigator, Penn State Social Science Research Institute "Developing a non-Gaussian spatiotemporal analysis tool for handling missing data: an application to cancer research." $14,996, 8/1/2008–7/31/2009.

Investigator, National Science Foundation (NSF-HSD) "What is a better prediction system?" (PI: G. Young) $749,992, 9/1/2007–8/31/2010.

Principal Investigator, National Science Foundation (NSF-SCREMS) "Scientific computing research environments for the mathematical sciences." $50,000, 9/01/2007–8/31/2008.

Teaching

STAT 200(H) Elementary Statistics for Honors Students, fall 2004–2008.

STAT 200 Elementary Undergraduate Statistics, fall 2004.

STAT 380 Introduction to Data Science, spring 2017, spring 2018.

STAT 414 Introduction to Probability Theory/Mathematical Statistics, spring 2009, fall 2010, fall 2012, spring 2014.

STAT 440 Computational Statistics, spring 2011, spring 2013.

STAT 463 Time Series, spring 2014, fall 2014.

STAT 515 Stochastic Processes and Monte Carlo Methods (graduate), spring 2005–2010, 2015.

STAT 540 Statistical Computing (graduate), fall 2013 – 2019.

STAT 597A Spatial Models (graduate), fall 2006, 2007, spring 2010.

ECOL 597B Advances in Ecology (graduate; team-taught), fall 2006–2008.

Advising

Ph.D.s Completed

1. Virginia Recta (February 2009; joint with J.L.Rosenberger). A model-based analysis of semi-continuous spatial data. *Mathematical Statistician, Food and Drug*

Administration (FDA).

2. K. Sham Bhat (June 2010). Inference for complex computer models and large multivariate spatial data with applications to climate science. *Scientist, Los Alamos National Laboratories.*

3. Matthew M. Tibbits (June 2011; joint with J.C. Liechty). Parallel Markov chain Monte Carlo. *Mathematical Statistician, Washington DC*

4. John Hughes (May 2011; joint with J. Fricks). Motor Proteins and Non-Gaussian Areal Data: Advances in Stochastic Modeling and Computation. *Assistant Professor, Biostatistics, University of Minnesota.* Now: *Assistant Professor, Biostatistics, University of Colorado-Denver.*

5. Roman Jandarov (June 2012). Inference with Intractable Likelihoods and Applications to Infectious Disease Models. *Postdoctoral fellow, Biostatistics, University of Washington. Now: Assistant Professor, University of Cincinnati, Biostatistics.*

6. Won Chang (May 2014). Climate Model Calibration using High-dimensional and Non-Gaussian Spatial Data. *Postdoctoral fellow, University of Chicago. Now: Assistant Professor, Department of Mathematical Sciences, University of Cincinnati..*

7. Joshua Goldstein (October 2015). Compartmental, Spatial and Point Process Models for Infectious Diseases. *Postdoctoral fellow, Social Decision Analytics Lab, Virgina Tech. Now: Research Assistant Professor, Social and Decision Analytics, Biocomplexity Institute, University of Virgina, VA.*

8. James Russell (May 2016; joint with Ephraim Hanks). Space-time Models for Animal Movement Data. *Assistant Professor, Muhlenberg College, Allentown, Pennsylvania.*

9. Yawen Guan (August 2017). Reduced-dimensional Non-Gaussian Spatial Models and Statistical Methods for Studying the West Antarctic Ice Sheet. *Postdoctoral fellow, Statistical and Applied Mathematical Sciences Institute (SAMSI), Durham, North Carolina. Current: Assistant Professor, Department of Statistics, University of Nebraska.*

10. Jaewoo Park (May 2019) Computational Methods for Models with Intractable Normalizing Functions. *Assistant Professor, Yonsei University, Seoul, South Korea.*

11. Ben Seiyon Lee (May 2020) Computational Methods for Hierarchical Spatial Models and Ice Sheet Model Calibration. *Assistant Professor, Department of Statistics, George Mason University, Virginia.*

Ph.D.s /postdocs Current

- Ben (Seiyon) Lee: Sequential Monte Carlo and projection methods for atmospheric sciences
- Xiaoxiao Li: Space-time modeling for foot and mouth disease
- Claire Kelling: Point process models for criminology
- John Mattiace: Statistical methods for studying the impact of vaccine hesitancy
- Bokgyeoung (Lydia) Kang: Methods for studying algorithms that use approximate likelihoods

- Sarah Shy (joint with H. Tak): Computational methods for astronomy
- Zhou Lan: Statistical methods for studying measles in Africa

M.S. Statistics

- M. Atiyat (2008). A comparison of frequentist and Bayesian approaches for linear Gaussian process models.
- C. Groendyke (2008). Ratio of uniforms Markov chain Monte Carlo for Gaussian process models.
- M.M. Tibbits (2009). Parallel multivariate slice sampling.

B.S. Statistics/Honors College Academic Advising

- 15 students in 2013–2014, 7 in the Schreyer Honors College; 2 undergraduate research advisees
- 18 students in 2015–2016, 3 in the Schreyer Honors College; 1 undergraduate research advisee

Ph.D. Thesis Committees

Within Statistics

Joseph Kang (December 2006)
Derek Young (June 2007)
Yuejiao (Heather) Ma (June 2009)
Juyoun Lee (September 2009)
Lu Zhang (October 2009)
Ivan Simeonov (July 2012)
Rashmi Bomiriya (2013)
Jason Bernstein (2016)
Meridith Baxter (ongoing)
Dhanushi Wijekulasuriya (ongoing)
Sayali Phadke (ongoing)
Sahar Zarmehri (ongoing)
Gregory Bopp (ongoing)

Rong Liu (February 2010)
Huei-Wen Teng (June 2010)
Ruth Hummel (December 2010)
Zhe Chen (August 2011)
Christophe Groendyke (December 2010)
Wei Wang (August 2013)
Daisy Phillips (2014)

Outside Statistics (all Ph.D., unless otherwise indicated)

V. Avasarala, Information Science and Technology (June 2006)
Omer Arda Vanli, Industrial Engineering (May 2007)
Tse-Chuan Yang, Demography and Rural Sociology (April 2008)
Jonathan A. Valverde, Civil and Environmental Engineering (June 2008)
Andrew Wilson, Ecology (February 2009)
Grigorios Emvalomatis, Agricultural Economics and Rural Sociology (May 2009)
Weina Ge, Computer Science (May 2010)
Lawrence Chien, Ecology/Center for Infectious Disease Dynamics
Andrew Norton, Ecology (M.S.)
Shuyi Zheng, Computer Science and Engineering.
Claudia Nau, Sociology (2011)
Jingchen Liu, Computer Science and Engineering (2011)
Roman Olson, Geosciences (2013)
Sunghoon Kim, Marketing (2013)

Matt Katz, Mathematics (2013)
Xuan Yu, Civil Engineering (2015)
Madian Khabsa, Computer Science and Engineering (2015)
Sameh Tajbakhsh, Industrial Engineering (2015)
Yicun Zhen, Mathematics (2016)
Mathieu Brener, Nuclear Engineering (2016)
Yifan Zhang, Marketing (ongoing)Judy Tsai, Atmospheric Science (ongoing)
Rob Ceres, Atmospheric Science (ongoing)
Rob Fuller, Geosciences (ongoing)

Service

Statistics Profession

- Leadership Council Member, Institute for Research in Statistics and its Applications, University of Minnesota. 2017– present.
- Scientific Program Committee for Climate Statistics Workshop, University of Minnesota. 2018.
- Treasurer, International Society for Bayesian Analysis (ISBA), 2014–2017.
- Tenure review for faculty from several departments.
- Director of Penn State research node for STATMOS (NSF Research Network for Statistical Methods for Atmospheric and Oceanic Sciences), 2014–.
- Chair, Risk Analysis Section, American Statistical Association (ASA), 2013–2014. Chair-Elect 2012–2013. Past Chair 2014–2015.
- Organizer (with B.J. Reich), the Workshop on Environmetrics (*ENVR 2012*), North Carolina State University.
- American Statistical Association (ASA) Advisory Committee on Climate Change Policy, 2009–2013. (Vice Chair since 2011).
- Member of Scientific Advisory Board for Spatial Statistics Conference "Mapping Global Change" 2013, Ohio State University.
- Editorial Management Committee member/representative from International Biometric Society to *Journal of Agricultural, Biological and Environmental Statistics*, 2012–2014.
- Chair of Young Investigator/Student Paper Awards Committee, Risk Analysis Section, American Statistical Association (ASA), 2012.
- Member, ASA Committee on Human Welfare Enhancement, 2004–2005.

Tutorials

- Statistics and Mathematical Sciences Institute (SAMSI) undergraduate workshop: lecture on statistical problems in climate science and disease modeling. North Carolina, October 2009.
- Tutorials in Markov chain Monte Carlo and spatial modeling for astronomers, Center for Astrostatistics summer school, June 2005–2015.
- Tutorial on statistical inference for complex computer models, Ohio State University Math Biosciences Institute (MBI) Summer School. July 2015.
- Tutorial on uncertainty quantification, SCRiM (Sustainable Climate Research Management) Summer School, Penn State. 2014–2015.

Penn State University

- Co-director, The Center for Climate Risk Management (CLIMA): an Earth and Environmental Systems Institute Center at Penn State. 2009–present.
- Member of Cybersciences Institute interdisciplinary cluster hire committee, 2012–2014.
- Penn State Institutes of Energy and the Environment (PSIEE) Eberly College of Science representative on advisory committee for spatial analysis. 2008–2010.
- Climate Committee, Eberly College of Science/Statistics Department, 2005–2007.
- Eberly College of Science IT Faculty Steering Committee.
- Search Committees: Penn State Institutes of Energy and the Environment, 2007–2008; Meteorology and Agricultural Economics and Rural Sociology, 2007–2008.

Department of Statistics, Penn State University

- Chair of Undergraduate Studies, 2012–2016.
- Organizer of weekly departmental seminar series "Stochastic Modeling and Computing" 2012–present.
- Chair of Faculty Hiring Committee, 2012–2013, 2016–2017.
- Member of Hiring Committee: 2013–2014, 2015–2016.
- Undergraduate Adviser, Statistics Department and Schreyer Honors College, 2012–present.
- Chair, Computing Committee, Statistics Department, 2006–2011.
- Qualifying Exam Committee, Statistics 2004–2005, 2007, 2008, 2010, 2011.
- Colloquium Committee, Statistics Department, 2004–2005.
- Conference Organizer, Statistics Day and C.R. and Bhargavi Rao Prize, 2005.

Editorial Work

Associate Editor, *Technometrics*, 2019–2021.
Co-Editor, *Bayesian Analysis*, 2016 – 2019.
Associate Editor, *The American Statistician*, 2014–present.
Associate Editor, *Journal of Agricultural, Biological & Environmental Stat*, 2011–2015.
Associate Editor, *Bayesian Analysis*, 2010–2015.
Associate Editor, *Biometrics*, 2009–2011.
Guest Editor, *Journal of Agricultural, Biological and Environmental Statistics* Special Issue on Computer Models and Spatial Data, 2011.
Guest Editor, *Statistical Methodology*, Special Issue on Statistics and Ecology, 2012.

Referee: American Statistician; Annals of Applied Statistics; Atmospheric Environment; Bayesian Analysis; Biometrics; CRC Press; Computational Statistics and Data Analysis; Environmental and Ecological Statistics; Environmetrics; International Journal of Health Geography; J. of the American Statistical Association; J. of Agricultural, Biological and Environmental Statistics; J. of Climate; J. of Computational and Graphical Statistics; J. of the Royal Statistical Society (B); J. of Statistical Planning and Inference; PLOS Computational Biology; Scandinavian Journal of Statistics; Science; Statistics and Computing; Statistical Methodology; Statistical Science; Statistica Sinica; ACM Transactions on Modeling and Computer Simulation (TOMACS)

Grant reviews

National Science Foundation (NSF-DMS) 2011.
Grant review panel at National Science Foundation Collaborations in Mathematics and

Geosciences (NSF-CMG) June 2009.
Grant reviewer: National Oceanic and Atmospheric Administration (NOAA).
Medical Research Council (MRC), United Kingdom.

Professional Memberships

American Statistical Association (including Sections on Statistics and Environment, Risk Analysis); Institute of Mathematical Statistics; International Society for Bayesian Analysis (including Section on Environmental Sciences), The International Environmetrics Society (TIES)