Stephan R. Sain

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EDUCATION

Rice University, Houston, Texas
1994 Ph.D., Statistics
     Dissertation: "Adaptive Kernel Density Estimation" (Directed by D.W. Scott)
1994 M.A., Statistics
1990 B.A., Mathematical Sciences and Statistics

PROFESSIONAL EXPERIENCE

Geophysical Statistics Project, Institute for Mathematics Applied to the Geosciences
National Center for Atmospheric Research, Boulder, CO

Scientist III	2009-present
Project Leader	2006-present

Department of Mathematical and Statistical Sciences
University of Colorado Denver, Denver, CO

Adjunct Associate Professor	2008-present
Associate Professor	2005-2008
Assistant Professor	2002-2005

Department of Statistics
The Ohio State University, Columbus, OH

Visiting Assistant Professor	Spring 2001

Department of Statistical Science
Southern Methodist University, Dallas, TX

Assistant Professor	1997-2001
Research Associate	1995-1997

National Security Statistics
Pacific Northwest National Laboratory, Richland, WA

Research Scientist	1994-1995

Current affiliate faculty appointments: Department of Applied Mathematics, University of Colorado; Department of Environmental and Occupational Health, University of Colorado Denver; Department of Statistics, Colorado State University; Department of Statistics, University of Wyoming.

Service

Training

Geophysical Statistics Project, National Center for Atmospheric Research
- Mathematical Science of Regional Climate (with D. Nychka)
  - Institute for Mathematical Sciences, National University of Singapore (3/2011)
- Summer School on Spatial Statistics (with D. Nychka, R. Furrer, and S. Bannerjee)
  - SAMSI Program on Space-Time Analysis (7/28/2009)
- Short course: Estimating curves and surfaces (with D. Nychka and R. Furrer)
  - The International Graduate Summer School on Statistics and Climate Modeling (8/9/2008)
  - American Statistical Association (ASA) Section on Statistics and the Environment (ENVR) Workshop on Environmetrics (10/22/08)
  - Eastern North American Region (ENAR) of the Biometric Society Spring Meeting (3/15/09)

Environmental Protection Agency (1998)
- Short course: multivariate statistics (principal components/factor analysis).

Rice Institute of Mathematical Sciences Summer Research Program (1996-98)
- Variable bandwidth kernels, classifying particle collisions, test ban treaty research.

University Teaching

Department of Mathematical Sciences, University of Colorado Denver (2002-2006)
- Regression and time series, probability, mathematical statistics, spatial statistics, independent studies, readings.

Department of Statistical Science, Southern Methodist University (1995-2001)
- Introductory statistics, business statistics, engineering statistics, design of experiments, computational statistics.

Department of Statistics, The Ohio State University (2001)
- Engineering statistics.

Department of Mathematical Sciences, University of Texas at Dallas (1996)
- Introductory statistics.

Department of Mathematics and Statistics, Washington State University, Tri-Cities (1994)
- Geostatistics.

Department of Statistics, Rice University (1991-92)
- Introductory statistics.

Current Students/Post-docs

- Will Kleiber (Post-doc, GSP/IMAGe)
- Tamara Greasby (Post-doc, GSP/IMAGe)
- Matt Heaton (Post-doc, GSP/IMAGe)
- Chris Lindley (PhD candidate, Epidemiology, UCDenver; committee member)
- Grant Weller (PhD candidate, Statistics, Colorado State University, committee member)

Former Post-docs

- Alicia Karspeck (CUDenver/GSP/IMAGe, NCAR; currently CGD, NCAR)
- Yongku Kim (GSP/IMAGe, NCAR; currently Assistant Professor, Department of Statistics, Yeungnam University, Daegu, South Korea)
- Cari Kaufman (GSP/IMAGe, NCAR; currently Assistant Professor, Department of Statistics, University of California, Berkeley)
- Bo Li (GSP/IMAGe, NCAR; currently Assistant Professor, Department of Statistics, Purdue University)

Ph.D. Students

University of Colorado Denver
- Mark Labovitz, "A statistical model for the joint distribution of the extreme values of equities," (2009, Department of Mathematical and Statistical Sciences)

Ph.D. Thesis Committees

University of Colorado Boulder
- Wenjin Mao (2007, Department of Applied Mathematics)

University of Colorado Denver
- Anne Sebert (2006, Health and Behavioral Sciences), Mansoureh Tajik (2003, Health and Behavioral Sciences)

Southern Methodist University
- Yongqiao Xiao (2000, Computer Science and Engineering), Jeff Pitblado (2000, Statistical Science), Carol Etzel (1999, Statistical Science), Jo Kuo (1999, Statistical Science), Bryan Adams (1998, Statistical Science)

Masters Committees

University of Colorado Denver
- Joe Darschewski (2007), Jason Gonzalez (Chair, 2007), Yongxia Kuang (Chair, 2007), Sarah Braudrick (2007), Erin Egan (2007), Diane Birks (MIS, 2006), Victor Akin (Chair, 2006), David Bosworth (MIS, 2006), Steve Fisher (Chair, 2006), Andy Kim (2006), Guerin Olsen (MIS, 2005), Edith Creek (Chair, 2004), Jeremy Reed (Chair, 2003)

Southern Methodist University
- Edward Sepulveda (2000), Tony Ying (Chair, 1999), Steve Robertson (1998), Jian Han (1998), Jorge Montemayor (1997), Brent Juusola (1997)

University of Colorado Denver Certificate Students

- David Bosworth, "Statistical analysis of climate extremes," 2006.
- Diane Wagner, "Mallards in South Platte Park: A statistical analysis of the South Platte Park mallard census data," 2005.

Committees and Professional Service

Institute for Mathematics Applied to Geosciences, NCAR
- CISL Research and Supercomputing Visitor Program (RSVP, 2008-present)
- UCAR/NCAR/UOP Awards Jury (2007-2009)
- Organizing Committee and Local Arrangements, 2007 TOY Workshop (May, 2007)

Department of Mathematical Sciences, UC Denver
- Faculty Search Committee
  - Applied statistics (2007-2008)
  - Computational mathematics (2005-2006)
  - Applied statistics (2005-2006)
- MATH 2830 Textbook Committee (2006)
- Executive Committee, elected (2005-2006)
- Merit Committee (2004, 2005, 2006)
- Applied Statistics Certificate Coordinator (2003-2006)
- Graduate Committee (2002-2006)
- Statistics Seminar Coordinator (2002-2004)

College of Liberal Arts and Sciences, UC Denver
- Statistics Task Force (2002)

University of Colorado Denver
- GIS Steering Committee (2006)
- Ad hoc Committee on Salary (2005)

Department of Statistical Science, Southern Methodist University
- Executive Planning Committee (2000-2001)
- Computing Liaison (1999-2001)
- Faculty Search Committee (1999, 2000)
- Jean Gibbons Applied Statistics Fellowship Review Committee (1999)
- Graduate Curriculum Review Committee (1998)
- Graduate Admissions Committee (1997-2000)
- Basic, MS, and PhD Qualifying Examination Committees (1997-2001)

Southern Methodist University
- Committee on Distance Education (1997-1999)

Professional Associations
- Organizing Committee, 2012-13 SAMSI Program on Statistical and Computational
  Methodology for Massive Datasets
- Organizing Committee, 2012 SIAM Conference on Uncertainty Quantification
- American Statistical Association Committee on Federally Funded Research (2011-2013)
- Organizing Committee, Earth Sciences Chair, 2010 Conference on Intelligent
  Data Understanding (CIDU)
- Organizing Committee, 2008 and 2010 American Statistical Association
  Section on Statistics and the Environment Workshop on Environmetrics
- Chair, American Statistical Association Section on Statistical Computing (2006;
  Chair-elect, 2005; Past-chair, 2007)
- Organized American Statistical Association Joint Statistical Meeting (JSM) topic
  contributed session (2004-2009, 2011-2012)

- Organized and chaired a JSM invited session (2000, 2011)
- Organized JSM roundtable luncheon (2000)
- JSM session chair (1996, 2006)
- JSM volunteer, Council on Sections (1995)

Editorial
- Guest Editor, *Environmetrics* special issue on Statistical Climatology (in progress)
- Associate Editor, *Journal on Uncertainty Quantification*, 2012-present
- Associate Editor, *JABES*, 2011-present
- Associate Editor, *Environmetrics*, 2010-present
- Associate Editor, *Journal of Computational and Graphical Statistics*, 2003-2011
- Referee: *Analytical Chemistry, Annals of Applied Statistics, Annals of Epidemiology, Annals of Statistics, The Astrophysical Journal, BMC Bioinformatics, CIS, Comm. in Statistics, Comp. Stat. and Data Analysis, Envr. & Ecol. Stat., Envr. Sci. & Tech, Environmetrics, Extremes, IEEE-TKDE, IEEE-Geoscience and Remote Sensing, JABES, JASA, JCGS, JGR – Atmospheres, J. of Climate, J. of Stat. Plan. and Inf., KAIS, Proceedings Lehmann Symposium, PNAS, Proc. of the Royal Society, Sankhya, Scan. Journal of Stat., SIREV, Statistica Sinica, Stat. Anal. and Data Mining, Statistical Science, Statistics and Computing, Stat. and Prob. Letters, Theoretical and Applied Climatology, Water Resources Research*

Proposal Review
- DOE SFA Review Panel (2010)
- National Science Foundation Review Panel (2005, 2010)
- NIH/NIEHS Review Panel (2006)
- Department of Energy, National Science Foundation, Pacific Northwest National Laboratory

Professional Organizations
- American Statistical Association
  - Sections: Biometrics, Statistical Computing, Statistical Graphics, Stats & the Environment, Nonparametrics, Bayesian Statistical Science
  - Chapters: Colorado-Wyoming
- The International Environmentrics Society
- American Geophysical Union
- American Meteorological Society

Recognitions, Honors, etc.

American Statistical Association Section of Physical and Engineering Science's Outstanding Presentation Award, Honorable Mention, 2002.

Grants and Contracts

- "System for Integrated Modeling of Metropolitan Extreme Heat Risk (SIMMER)," NASA, $1500000, 5/1/10-4/30/13, NCAR: Wilhelmi (PI), Sain, others.

- "CMG Collaborative Research: Models, Tools and Analysis for Studies of the Magnetosphere and Upper Atmosphere," NSF. $665,000, 9/1/09-8/31/12, NCAR: Sain (PI),

Wiltberger; BYU: Reese.

- "Analysis of climate simulations from the North American Regional Climate Change Assessment Program (NARCCAP) for the assessment of potential global change impacts on U.S. water quality and aquatic ecosystems," EPA. $629,316, 10/1/08-9/30/10, NCAR: Mearns (PI) and Sain.

- "Multi-resolution lattice models and theory for spatial process estimators," NSF. $337,000, 8/1/07-7/30/10, NCAR: Sain (PI) and Nychka.

- "Inferring the extremes of climate from geophysical models and observations," NCAR Weather and Climate Impacts Assessment Science Program, $45,000, 10/06-9/09. NCAR: Sain (PI) and Nychka; UNC: Smith.

- "Collaborative Research: The North American Regional Climate Change Assessment Program (NARCCAP)–Using Multiple GCMs and RCMs to Simulate Future Climates and Their Uncertainty," NSF, $190,000, 1/06-1/09. NCAR: Mearns (PI), Kuo, Middleton, Nychka; UCSC: Sloan; ISU: Guttowski, Arritt, Takle; UCSD: Roads; PNNL: Leung; UC Denver: Sain; LLNL: Duffy, Bader.

- "SGER: Statistical analysis of multi-model ensembles of climate experiments," NSF, $20,000, 2/05-1/06.

- "Interactive analysis of heterogeneous data to determine the impact of weather on crop yield," NASA AIST, $80,000, 10/04 - 9/06. JPL: Kiri Wagstaff (PI); UC Denver: Sain.

- "A statistical analysis of differential gene expression in cerebral vascular malformations," CU Genome-Biotechnology Initiative, $100,000, 6/03-6/04.

- "Geophysical statistics project," National Center for Atmospheric Research, 7/02-7/06 (subcontract to UC Denver).

- "Multivariate spatial modeling," UC Denver Faculty Grant Award, 2002-2003.

- "Hierarchical methods for environmental justice," Southern Methodist University Research Council, 1/01-5/02.
  mining," ASA Section on Nonparametric Statistics, 1/12/01.

- "Peer review of statistical methods and GIS," United States Environmental Protection Agency, 10/00-10/01.

PUBLICATIONS

THESIS

1. Sain, S.R. (1994), "Adaptive kernel density estimation," Ph.D. Thesis, Rice University (http://scholarship.rice.edu/handle/1911/16743).

REFEREED JOURNAL ARTICLES

2. Sain, S.R., Baggerly, K.A., and Scott, D.W. (1994), "Cross-validation of multivariate densities," *Journal of the American Statistical Association*, **89**, 807-817.

3. Holmström, L., Sain, S.R., and Miettinen, H.E. (1995), "A new multivariate technique for top quark search," *Computer Physics Communications*, **88**, 195-210.

4. Sain, S.R. and Scott, D.W. (1996), "On locally adaptive density estimation," *Journal of the American Statistical Association*, **91**, 1525-1534.

5. Holmström, L. and Sain, S.R. (1997), "Multivariate discrimination methods for top quark analysis," *Technometrics*, **39**, 91-99.

6. Wang, S., Woodward, W.A., Gray, H.L., Wiechecki, S., and Sain, S.R. (1997), "A new test for outlier detection from a multivariate mixture distribution," *Journal of Computational and Graphical Statistics*, **6**, 285-299.

7. Sain, S.R., Gray, H.L., Woodward, W.A., and Fisk, M.D. (1999), "Outlier detection from a mixture distribution when training data are unlabeled," *Bulletin of the Seismological Society of America*, **89**, 294-304.

8. Guerra, R., Etzel, C.J., Goldstein, D.R., and Sain, S.R. (1999), "Meta-analysis by combining p-values: simulated linkage studies," *Genetic Epidemiology*, **S. 1**, S605-S609.

9. Goldstein, D.R., Sain, S.R., Guerra, R., Etzel, D.R. (1999), "Meta-analysis by combining parameter estimates: simulated linkage studies," *Genetic Epidemiology*, **S. 1**, S581-S585.

10. Sain, S.R. (2001), "Bias reduction and elimination with kernel estimators," *Communications in Statistics (Special Issue in Honor of the 80th Birthday of C.R. Rao)*, **30**, 1869-1888.

11. Woodward, W.A., Sain, S.R., Gray, H.L., Zhao, B., and Fisk, M.D. (2002), "Testing for multivariate outliers in the presence of missing data," *Pure and Applied Geophysics*, **159**, 889-904.

12. Sain, S.R. (2002), "Multivariate locally adaptive density estimation," *Computational Statistics and Data Analysis*, **39**, 165-186.

13. Sain, S.R. and Scott, D.W. (2002), "Zero-bias locally adaptive density estimators," *Scandinavian Journal of Statistics*, **29**, 441-460.

14. Christensen, W.F. and Sain, S.R. (2002), "Accounting for dependence in a flexible multivariate receptor model," *Technometrics*, **44**, 328-337.

15. Sain, S.R. (2003), "A new characterization and estimation of the zero-bias bandwidth," *Australian & New Zealand Journal of Statistics*, **45**, 29-42.

16. Woodward, W.A. and Sain, S.R. (2003), "Testing for outliers from a mixture distribution when some data are missing," *Computational Statistics and Data Analysis*, **44**, 193-210.

17. Tao, Y., Kupfer, R., Stewart, B., Williams-Skipp, C., Crowell, C., Patel, D.D., Sain, S., and Scheinman, R.I. (2006), "AIRE recruits multiple transcriptional components to specific genomic regions through tethering to nuclear matrix," *Molecular Immunology*, **43**, 335-345.

18. Sain, S.R., Mearns, L., Shrikant, J., and Nychka, D. (2006), "A multivariate spatial model for soil water profiles," *Journal of Agricultural, Biological, and Environmental Statistics*, **11**, 462-480.

19. Gault, J., Sain, S., Hu, L., and Awad, I.A. (2006), "Spectrum of genotype and clinical manifestations in cerebral cavernous malformations," *Neurosurgery*, **59**, 1278-1285.

20. Furrer, R., Knutti, R., Sain, S.R., Nychka, D.W., and Meehl, G.A. (2007), "Spatial patterns of probabilistic temperature change projections from a multivariate Bayesian analysis," *Geophysical Research Letters*, **34**, L06711, doi:10.1029/2006GL027754.

21. Sain, S.R. and Cressie, N. (2007), "A spatial model for multivariate lattice data," *Journal*

of Econometrics, **140**, 226-259, doi:10.1016/j.jeconom.2006.09.010.

22. Furrer, R., Sain, S.R., Nychka, D., and Meehl, G.A. (2007), "Multivariate Bayesian analysis of atmosphere-ocean general circulation models," *Environmental and Ecological Statistics*, **14**, 249-266, doi:10.1007/s10651-007-0018-z.

23. Bennet, A., Sain, S.R., Vargas, E., Moore, L.G. (2008), "Evidence that parent-of-origin affects birthweight reductions high altitude," *American Journal of Human Biology*, **20**, 592-597.

24. Furrer, R. and Sain, S.R. (2009), "Spatial model fitting for large datasets with applications to climate and microarray problems," *Statistics and Computing*, **19**, 113-128, doi:10.1007/s11222-008-9075-x.

25. Sebert Kuhlmann, A., Brett, J., Thomas, D., and Sain, S.R. (2009), "Pedestrian motor vehicle (PMV) collisions and associated environmental characteristics in Denver, Colorado," *American Journal of Public Health*, **99**, 1632-1637.

26. Kaufman, C.G. and Sain, S.R. (2010), "Bayesian functional ANOVA modeling using Gaussian process prior distributions," *Bayesian Analysis*, **5**, 123–150, doi:10.1214/10-BA505.

27. Schliep, E.M., Cooley, D., Sain, S.R., and Hoeting, J.A. (2010), "A comparison study of extreme precipitation from six different regional climate models via spatial hierarchical modeling," *Extremes*, **13**, 219-239, doi:10.1007/s10687-009-0098-2.

28. Fowler, H.J., Cooley, D., Sain, S.R., and Thurston, M. (2010), "Detecting change in UK extreme precipitation using results from the climateprediction.net BBC Climate Change Experiment," *Extremes*, **13**, 241-267, doi:10.1007/s10687-010-0101-y.

29. Shamseldin, E.C., Smith, R.L., Sain, S.R., Mearns, L.O., and Cooley, D. (2010), "Downscaling extremes: A comparison of extreme value distributions in point-source and gridded precipitation data," *Annals of Applied Statistics*, **4**, 484-502, doi:10.1214/09-AOAS287

30. Sain, S.R. and Furrer, R. (2010), "Combining Climate Model Output via Model Correlations," *Stochastic Environmental Research and Risk Assessment*, **24**, 821-829, doi:10.1007/s00477-010-0380-5.

31. Cooley, D. and Sain, S.R. (2010), "Spatial hierarchical modeling of precipitation extremes from a regional climate model," *Journal of Agricultural, Biological, and Environmental Statistics*, **15**, 381-402, doi:10.1007/s13253-010-0023-9

32. Furrer, R. and Sain, S.R. (2010), "spam: A sparse matrix R package with emphasis on MCMC methods for Gaussian Markov random fields," *Journal of Statistical Software*, **36**, 1-25, `http://www.jstatsoft.org/v36/i10`.

33. Holmstrom, L., Pasanen, L., Furrer, R., and Sain, S.R. (2011), "Scale space multiresolution analysis of random signals," *Computational Statistics and Data Analysis*, **55**, 2840-2855, doi:10.1016/j.csda.2011.04.011.

34. Sain, S.R., Furrer, R., and Cressie, N. (2011), "A Spatial Analysis of Multivariate Output from Regional Climate Models," *Annals of Applied Statistics*, **5**, 150-175, doi:10.1214/10-AOAS369.

35. Sain, S.R., Nychka, D., and Mearns, L. (2011), "Functional ANOVA and regional climate experiments: A statistical analysis of dynamic downscaling," *Environmetrics*, **22**, 700-711, doi: 10.1002/env.1068

36. Karspeck, A.R., Kaplan, A., and Sain, S.R. (2011), "Bayesian modeling and ensemble reconstruction of mid-scale spatial variability in North Atlantic sea surface temperatures for 1850-2008," *Quarterly Journal of the Royal Meteorological Society*, **138**, 234-248, doi: 10.1002/qj.900.

37. Li, B., Sain, S.R., Mearns, L.O., Anderson, H.A., Kovats, R.S., Ebi, K.L., Bekkedal, M., Kanarek, M.S., and Patz, J.A. (2011), "The impact of heat waves on morbidity in Milwaukee, Wisconsin," *Climatic Change*, **110**, 959-976, doi: 10.1007/s10584-011-0120-y.

38. Greasby, T.A. and Sain, S.R. (2011), "Multivariate spatial analysis of climate change projections," *Journal of Agricultural, Biological, and Environmental Statistics*, **16**, 571-585, doi: 10.1007/s13253-011-0072-8

39. Christensen, W.F. and Sain, S.R. (2011), "Spatial latent variable modeling for integrating output from multiple climate models," *Mathematical Geosciences*, doi: 10.1007/s11004-011-9321-1.

40. Kang, E., Cressie, N., Sain, S. (2011), "Combining Outputs from the NARCCAP Regional Climate Models Using a Bayesian Hierarchical Model," *Applied Statistics*, doi: 10.1111/j.1467-9876.2011.01010.x

41. Furrer, R., Geinitz, S., and Sain, S.R. (2011), "Assessing variance components of general circulation model output fields," *Environmetrics*, to appear.

42. Mearns, L.O., Arritt R., Biner, S., Bukovsky, M.S., McGinnis, S., Sain, S., Caya, D., Correia, J., Flory, D., Gutowski, W., Takle, E.S., Jones, R., Leung, R., Moufouma-Okia, W., McDaniel, L., Nunes, A.M.B., Qian, Y., Roads, J., Sloan, L., Snyder, M. (2010), "The North American regional climate change assessment program: Overview of phase I results," *Bulletin of the American Meteorological Society*, to appear.

Book Chapters

43. Scott, D.W. and Sain, S.R. (2005), "Multi-dimensional density estimation," In Rao, C.R., Wegman, E., and Solka, J. (eds.), *Handbook of Statistics 24: Data Mining and Data Visualization*, New York: Elsevier Publishing, 229-261.

44. Minnotte, D., Sain, S.R., and Scott, D.W. (2007), "Multivariate visualization by density estimation," in Chen, C., Härdle, W., and Unwin, A. (eds.), *Handbook of Data Visualization*, Berlin: Springer, 389-413.

Reviews, Comment and Editorial

45. Sain, S.R. (1996), "Review of *The Nature of Statistical Learning Theory*," *Technometrics*, **38**, 409.

46. Sain, S.R. and Scott, D.W. (1996), "A discussion of flexible smoothing with b-splines and penalties," *Statistical Science*, **11**, 114-115.

47. Sain, S.R. (2006), "Review of *Analysis and Modeling of Spatial Environmental Data*," *Journal of the American Statistical Association*, **101**, 1312.

48. Sain, S.R. (2006), "A word from our chairs," *Statistical Computing and Graphics Newsletter*, **17(1)**, June 2006.

49. Sain, S.R. (2006), "Eight invited sessions show a need for advances in statistical computing," *Amstat News*, June 2006.

50. Sain, S.R. (2006), "A word from our chairs," *Statistical Computing and Graphics Newsletter*, **17(2)**, November 2006.

Proceedings, Reports, and other Publications

51. Ensor, K.B., Sain, S.R., and Scott, D.W. (1992), "Ozone and air quality in Houston: 1980–1990," *Proceedings of the American Statistical Association; Section on Statistical Graphics*, 39-48.
52. Holmström, L. and Sain, S.R. (1993), "Searching for the top quark using multivariate density estimates," Technical Report, Department of Statistics, Rice University.
53. Whitney, P.D. and Sain, S.R. (1995), "Summary of temperature data related to interim stabilization," Letter Report to Westinghouse Hanford Company, Pacific Northwest Laboratory.
54. Whitney, P.D., Sain, S.R., and Miley, T.B. (1995), "Applicability of multi-state modeling to monitoring Hanford waste tank surface levels," Letter Report to Westinghouse Hanford Company, Pacific Northwest Laboratory.
55. Miettinen, H.E., Holmström, L., and Sain, S.R. (1995), "Top quark search with probability density estimates and neural networks," *Proceedings of the Fourth International Workshop on Software Engineering and Artificial Intelligence for High Energy and Nuclear Physics*.
56. Anderson, D.N., Anderson, K.K., Hagedorn, D.N., Sain, S.R., and Young, C.J. (1995), "Statistical issues in seismic monitoring," Technical Report PNL-10678, Pacific Northwest Laboratory.
57. Anderson, D.N., Anderson, K.K., Hagedorn, D.N., Sain, S.R., and Young, C.J. (1995), "Statistical frameworks for seismic discrimination," *Proceedings of 17th Seismic Research Symposium on Monitoring a Comprehensive Test Ban Treaty*.
58. Whitney, P.D. and Sain, S.R. (1995), "Reducing the variability of thermocouple based temperature estimates," *Proceedings of the American Statistical Association; Section on Physical and Engineering Sciences*, 91-96.
59. Holmström, L. and Sain, S.R. (1995), "Using multivariate discrimination in top quark search," *Proceedings of the American Statistical Association; Statistical Computing Section*, 102-107.
60. Gray, H.L., Woodward, W.A., Sain, S.R., and Frawley, W.H. (1996), "Statistical methods for automated detection of extreme events," Technical Report, Phillips Laboratory.
61. Gray, H.L., Sain, S.R., Frawley, W.H., and Woodward, W.A. (1996), "On detecting outliers in mixed populations," Technical Report, Phillips Laboratory.
62. Sain, S.R., Gray, H.L., and Woodward, W.A. (1996), "Outlier detection without ground truth," *Proceedings of 18th Seismic Research Symposium on Monitoring a Comprehensive Test Ban Treaty*.
63. Woodward, W.A., Sain, S.R., Gray, H.L., and Fisk, M.D. (1999), "Outlier testing when some data are missing," *Proceedings of the 21st Seismic Research Symposium: Technologies for Monitoring The Comprehensive Nuclear-Test-Ban Treaty*, **1**, 674-680.
64. Christensen, W.F. and Sain, S.R. (2000), "Use of latent variable models in air quality monitoring," *Computing Science and Statistics*, **32**, 313-325.
65. Guerra, R., Sain, S.R., Carney, G. (2000), "Statistical issues arising in environmental equity: a case study in Louisiana," *American Statistical Association Proceedings of the Joint Statistical Meetings, Biometrics Section*, 53-61.
66. Sain, S.R. and Carmack, P.S. (2001), "A mixture approach for multivariate regression

trees," *2001 Proceedings of the American Statistical Association [CD-ROM]*, Alexandria, VA: American Statistical Association.

67. Sain, S.R. and Carmack, P.S. (2002), "Boosting multi-objective regression trees," *Computing Science and Statistics*, **34**, 232-241.

68. Carmack, P.S. and Sain, S.R. (2002), "Permutation testing in multivariate regression trees," *American Statistical Association Proceedings of the Joint Statistical Meetings*, 397-402.

69. Sain, S.R. and Cressie, N. (2002), "Multivariate lattice models for spatial environmental data," *American Statistical Association Proceedings of the Joint Statistical Meetings*, 2820-2825.

70. Fitzgerald, M. and Sain, S.R. (2004), "A Bayesian dynamic model for multivariate space-time groundwater data," *American Statistical Association Proceedings of the Joint Statistical Meetings*, 58-64.

71. Wagstaff, K.L., Mazzoni, D., and Sain, S.R. (2005), "HARVIST: A system for agricultural and weather studies using advanced statistical models," *Proceedings of the Earth-Sun Systems Technology Conference*, June 2005.

72. Shamseldin, E.C., Smith, R.L., and Sain, S.R. (2007), "The spatial scaling effect for precipitation extremes," In *Bulletin of the International Statistical Institute, LXII*, 1357-1364, Instituto Nacional de Statística, Lisoboa, Portugal.

73. Sain, S.R., Furrer, R., and Cressie, N. (2007), "Combining regional climate model output via a multivariate Markov random field model," In *Bulletin of the International Statistical Institute, LXII*, 1375-1382, Instituto Nacional de Statística, Lisoboa, Portugal.

74. Sain, S.R. and Furrer, R. (2008), "Fitting large-scale spatial models with applications to microarray data analysis," *Computing Science and Statistics*, **36**, I2004Proceedings/SainStephan/SainStephan.paper.pdf

Works in Progress

Research Papers

75. French, J.P. and Sain. S.R. (2012), "Spatio-temporal exceedance locations and confidence regions," *Annals of Applied Statistics*, submitted.

76. Pratola, M.T., Sain, S.R, Bingham, D., Wiltberger, M., and Rigler, J. (2012), "Efficient calibration of complex computer models," *Technometrics*, submitted.

77. Weller, G.B., Cooley, D.S., and Sain, S.R. (2012), "An investigation of the pineapple express phenomenon via bivariate extreme value theory," *Environmetrics*, submitted.

78. Geinitz, S., Furrer, R., and Sain, S.R. (2012), "MMANOVA: A general multilevel framework for multivariate analysis of variance," *Scandinavian Journal of Statistics*, submitted.

79. Sain, S.R. and Kaufman, C.K. (2011),"Hierarchical modeling of variability in regional climate models using Markov random fields," *Environmental and Ecological Statistics*, submitted.

80. Jin, C., Steen-Adams, M.M., Zhu, J., Sain, S.R., and Gangon, R.E. (2011), "Spatial multinomial regression models for nominal categorical data: A study of land cover in northern Wisconsin, USA," *Biometrics*, submitted.

Books and Chapters

81. Sain, S.R. (2012), "Uncertainty and computer models," in *Encyclopedia of Environmetrics 2e*.

82. Sain, S.R., Minnotte, M., and Scott, D.W. (2008), "Multivariate density estimation," in *Wiley Interdisciplinary Reviews: Computational Statistics.*
83. Sain, S.R. (2008), "Multivariate spatial models," in *Wiley Interdisciplinary Reviews: Computational Statistics.*
84. Sain, S.R., Furrer, R., and Nychka, D. (2008), *Experiments on the Earth: Smoothing and Spatial Statistics for Geophysical Applications using R*, Springer-Verlag.

INVITED PRESENTATIONS

"Calibration of complex computer models: A case study a model of the magnetosphere"
• Accelerating Industrial Productivity via Deterministic Computer Experiments and Stochastic Simulation Experiments, Isaac Newton Institute for Mathematical Sciences, Cambridge, UK, 9/5/2011

"A statistical analysis of regional climate model ensembles"
• American Chemical Society Fall National Meeting, 9/1/2011
• 58th Congress of the ISI, Dublin, Ireland, 8/22/2011

"A computational framework for the statistical analysis of climate model ensembles"
• 2011 Joint Statistical Meetings, Miami, FL, 8/3/2011

"Uncertainty, functional anova, and regional climate experiments"
• Integrated Regional Earth System Modeling, Boulder, CO, 6/2/2011

"Uncertainty in regional climate model experiments"
• DOE SciDAC 2011, Denver, CO, 7/12/2011
• NARCCAP Users Meeting, Boulder, CO, 4/7/2011
• NARCCAP PIs Meeting, Boulder, CO, 4/6/2011
• Stat. Methods for Meteorology and Climate Change, CRM, Montreal, Canada, 1/12/2011

"Statistical analysis of regional climate model ensembles"
• Bayesian Inference for Latent Gaussian Models, University of Zurich, 2/2/2011

"A statistical approach for process-orientated analysis of regional climate models"
• 2010 AGU Fall Meeting, 12/17/2010

"Statistical methods for analyzing regional climate model ensembles"
• 2010 AGU Fall Meeting, 12/14/10

"NARCCAP: Statistical design, methodology, and case studies"
• NARCCAP PIs Meeting, Boulder, CO, 10/18/10

"Statistical analysis of a regional climate model ensemble: Detecting the ENSO response"
• Annual Meeting of the Institute of Mathematical Statistics, Gothenburg, Sweden, 8/13/10

"NARCCAP: Design and analysis of a regional climate model experiment"
• International Meeting on Statistical Climatology, Edinburgh, Scotland, 7/15/10

"Analyzing and combining regional climate model ensembles"
• 41st Interface Symposium, Seattle, WA, 6/18/2010
• Resampling Methods and High-Dimensional Data, Texas A&M University, 3/25/10

"Statistical analysis of regional climate experiments"
• Department of Statistics, Purdue University, 3/5/10

"Spatial analysis of regional climate model ensembles"
• Department of Geological and Atmospheric Sciences, Iowa State University, 11/10/09

"Spatial analysis of regional climate model ensembles"
• INFORMS Annual Meeting, San Diego, CA, 10/09

"Regional climate, NARCCAP, and health impacts"
• 2009 Joint Statistical Meetings, Washington, D.C., 8/09

"Extreme events and uncertainty"
• Third biannual NCAR Workshop on Climate and Health, Boulder, CO, 7/09

"Spatial Analysis of Regional Climate Model Ensembles"
• Annual Conference of The International Environmetrics Society, Bologna, Italy, 7/09

"Assessments of uncertainty in regional climate model ensembles"
• 2009 Spring Research Conference on Statistics in Industry and Technology, 5/09
• 2009 Annual Meeting of the Statistical Society of Canada, 5/09

"Calibrating complex computer models: A case study"
• Adaptive design for Sequential Monte Carlo and Computer Modeling, SAMSI, 4/09

"Statistical Science at the National Center for Atmospheric Research"
• Department of Statistics, The Ohio State University, 3/31/09
• Department of Statistics, Rice University, 3/16/09

"Spatial Analysis of Regional Climate Model Experiments"
• Institute for Mathematics Applied to Geosciences, NCAR, 3/11/09

"Markov random fields and regional climate model ensembles"
• Department of Statistics, University of Chicago, 3/2/09
• Department of Statistics, University of New Mexico, 1/23/09
• Department of Statistical Sciences, Los Alamos National Laboratory, 1/21/09

"Functional ANOVA and the analysis of model ensembles"
• 2008 AGU Fall Meeting, 12/18/08

"A case study: Environmental equity"
• ADAPTE Project Workshop, Boulder, CO, 11/17/08

"Design, uncertainty, and NARCCAP"
• NARCCAP Workshop, Boulder, CO, 11/11/08

"Statistical Calibration of Complex Computer Models"
• Space Weather Prediction Center, NOAA, Boulder, CO, 9/11/08

"Models and models: Assessing uncertainty in regional climate experiments"
• 2008 Joint Statistical Meetings, Denver, CO, 8/07/08

"Assessing uncertainty in regional climate experiments"
• National Science Foundation, 6/2/08

"Assessing uncertainty in regional climate experiments"
• Uncertainty Quantification Workshop, Univ. of Arizona, 4/26/08
• NARCCAP Users Meeting, Boulder, CO, 2/15/08

"Models and models: Statistical approaches for analyzing regional climate model output"
- Department of Mathematics and Statistics, Univ. of Maryland Baltimore County, 2/8/08
- Department of Applied Mathematics and Statistics, Johns Hopkins University, 2/7/08
- Department of Statistics, University of Wyoming, 2/1/08

"Analyzing regional climate experiments via multivariate spatial models"
- 2007 AGU Fall Meeting, 12/14/07

"Models and models: Statistical analysis of regional climate model output"
- IMAGe/Univ. of Wyoming Workshop, Steamboat, CO, 11/10/07
- Department of Statistics, CSU, 11/5/07

"Models and models: Geoscience and statistics at NCAR"
- SAMSI CDI Workshop, 11/1/07

"Analyzing Regional Climate Experiments via Multivariate Spatial Models"
- Department of Statistics, The Ohio State University, 11/15/07
- Department of Economics, UC Denver, 10/5/07

"Statistical analysis of regional climate model output"
- 56th Session of the International Statistical Institute, Lisbon, Portugal, 8/27/07

"Markov random fields, remote sensing, and predicting crop yields"
- Joint Statistical Meetings, Salt Lake City, UT, 8/1/07

"Smoothing and spatial statistics for geophysical applications using `fields`"
- Invited Poster, 2007 Joint Statistical Meetings, Salt Lake City, UT, 7/30/07

"Calibrating the LFM Model"
- IMAGe TOY 2007: Applications of Statistics to Numerical Models, 5/21/07

"GSP and the IMAGe 2007 TOY: Statistics for Numerical Models"
- Early Career Scientists Association, NCAR, 5/18/07

"Statistics and computer models: A case study using TIGECM"
- Department of Statistics, Brigham Young University, 12/13/06

"Multivariate Markov random field models for assessing regional climate model output"
- Department of Statistics, Brigham Young University, 12/12/06
- Multivariate Methods in Environmetrics, Chicago, IL, 10/27/06

"Statistics for Computer Models"
- SAMSI Kickoff Workshop, 9/14/06

"Geophysical Statistics Project"
- IMAGe Advisory Panel, 10/3/06
- IMAGe Retreat, 8/28/06

"Assessments of climate change using regional climate models"
- 38th Interface Symposium, Pasadena, CA, 5/26/06

"Models for multivariate lattice data with applications to racially biased policing"
- Colorado-Wyoming ASA Chapter Spring Meeting, Boulder, CO, 4/21/06

"Combining climate model output via multivariate statistical models"
- Geophysical Statistics Project, IMAGe, NCAR, 4/11/06

"Models for multivariate spatial lattice data and assessing climate change"
- Department of Statistics, Rice University, 2/20/06
- Biostat. and Clinical Sci., Univ. of Texas, Southwestern Medical School, 2/16/06
- Dept. of Applied Mathematics, University of Colorado, Boulder, 11/11/05

"Multi-response smoothing and estimation of soil water profiles"
- Department of Statistical Science, Southern Methodist University, 2/17/06
- Department of Mathematics, University of Colorado Denver, 4/15/05

"Fitting large scale mixed models with applications to microarray experiments"
- Center for Computational Biology, University of Colorado Denver, 4/1/05

"A statistical analysis of differential gene expression in cerebral vascular malformations"
- Butcher Symposium on Genomics and Biotechnology, Denver, CO, 11/11/04

"Spatial models for multivariate lattice data"
- Spring Research Conf. on Stat. in Industry and Technology, Gaithersburg, MD, 5/21/04

"Flexible models for multivariate spatial data"
- Dept. of Math. and Computer Sciences, Colorado School of Mines, 2/20/04
- Dept. of Applied Mathematics, University of Colorado, Boulder, 11/19/03

"Modeling soil water profiles"
- Machine Learning Systems Group, Jet Propulsion Laboratory, 1/27/05
- Geophysical Statistics Project, NCAR, 9/8/03

"Modeling soil and weather characteristics for crop models"
- Geophysical Statistics Project, NCAR, 3/25/03

"Multivariate lattice models for spatial environmental data"
- Department of Statistics, Colorado State University, 11/18/02

"Multivariate lattice models and environmental equity"
- Department of Mathematics, University of Colorado Denver, 9/25/02

"An overview of health science applications of GIS & spatial statistics"
- Colorado Health Data Advisory Committee (CoHDAC), 5/9/02

"Directed clustering - using mixtures to fit regression trees"
- Geophysical Statistics Project, NCAR, 1/31/02
- Department of Statistical Science, Southern Methodist University, 11/19/01
- Department of Statistics, Rice University, 10/29/01
- Department of Statistics, Texas A&M University, 9/20/01

"Regression trees, mixture models, and directed clustering"
- Department of Mathematics, University of Colorado Denver, 3/30/01
- Department of Systems Engineering, University of Virginia, 3/23/01

"Issues in measuring environmental equity"
- *Discussant*, 2000 Joint Statistical Meetings, Indianapolis, IN, 8/16/00

"Bias reduction and elimination in kernel estimates"
- Statistics: Reflections on the Past and Visions for the Future, San Antonio, TX, 3/19/00

"Statistical issues in environmental justice"
- Conference of Texas Statisticians, Dallas, TX, 4/16/99

"EDA, AI, and data mining: applications in health care"
• The National Managed Health Care Congress, 5/20/98

"Exploratory data analysis with biomedical applications"
• The National Managed Health Care Congress, 9/17/97

"A study of multivariate adaptive density estimation"
• IMS Annual Meeting, Park City, UT, 7/28/97

"Exploring the potential of locally adaptive density estimation"
• NSF Workshop: Bumps, Jumps, Clustering, and Discrimination, Houston, TX, 5/13/97

"Locally adaptive kernel density estimation"
• Department of Mathematics, University of Colorado Denver, 2/97
• Department of Statistics and Actuarial Science, University of Iowa, 2/97
• Department of Statistics, Iowa State University, 2/13/97
• Department of Statistical Science, Southern Methodist University, 1/31/97
• Dept. of Dec. Sci. and Eng. Sys., Rensselaer Polytechnic Institute, 1/97
• Statistics Department, Case Western Reserve University, 1/22/97

"Locally adaptive density estimation"
• Conference of Texas Statisticians, Nacogdoches, TX, 4/20/96
• North Texas Chapter of the American Statistical Association, Dallas, TX, 11/30/95

"Variable kernel density estimation"
• Statistics and Decision Sciences, Miles, Inc., 4/21/94
• Analytical Sciences Department, Pacific Northwest Laboratory, 4/8/94
• Department of Mathematical Sciences, New Mexico State University, 2/10/94

"Cross-validation of multivariate densities"
• Department of Biomathematics, M. D. Anderson Cancer Center, 1/19/94
• Department of Statistical Science, Southern Methodist University, 11/5/93

Contributed Presentations

"Functional ANOVA and regional climate experiments: A statistical analysis"
• European Geosciences Union General Assembly, Vienna, Austria, 5/5/10 (poster)

"Assessing uncertainty in regional climate experiments"
• 89th AMS Annual Meeting, Phoenix, AZ, 1/15/09

"Models for multivariate lattice data and assessments of climate change"
• 2006 Joint Statistical Meetings, Seattle, WA, 8/8/06 (topic contributed)

"Combining climate model output for assessments of climate change"
• 2005 Joint Statistical Meetings, Minneapolis, MN, 8/7/05 (topic contributed)

"Multiresponse smoothing and spatial models"
• 2004 Joint Statistical Meetings, Toronto, CA, 8/12/04 (topic contributed)

"Fitting large-scale spatial models with applications to microarray data"
• 36th Interface Symposium, Baltimore, MD, 5/29/04

"Nonparametric models of soil characteristics for crop models"
• 2003 Joint Statistical Meetings, San Francisco, CA, 8/13/03

"Modeling soil and weather characteristics for crop models"
• 35th Interface Symposium, Salt Lake City, UT, 3/14/03

"Multivariate lattice models for spatial environmental data"
• 2002 Joint Statistical Meetings, New York City, NY, 8/13/02

"Boosting multi-objective regression trees"
• 34th Interface Symposium, Montreal, CA, 4/18/02

"A mixture approach for multivariate response regression trees"
• 2001 Joint Statistical Meetings, Atlanta, GA, 8/8/01

"A mixture approach to generalized regression trees"
• Poster, Nonparametrics in Large, Multidimensional Data Mining, Dallas, TX, 1/12/01

"Locally adaptive kernel estimation"
• 2000 Joint Statistical Meetings, Indianapolis, IN, 8/14/00

"Outlier detection without ground truth"
• Poster, 18th Seismic Research Symposium, Annapolis, MD, 9/4/96