ANNIE SAUER BOOTH

CONTACT INFO

Department of Statistics
Virginia Tech
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RESEARCH INTERESTS

Bayesian statistics, surrogate modeling, statistical computing, design of experiments, uncertainty quantification, optimization, calibration, reliability. With applications to computer experiments.

EDUCATION

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Ph.D. Statistics, May 2023, advised by Robert B. Gramacy & David Higdon
Dissertation: *Deep Gaussian Process Surrogates for Computer Experiments*
M.S. Statistics, December 2019

AUBURN UNIVERSITY
Honors Scholar; 4.00 GPA
B.S. Applied Mathematics, May 2018
B.A. Psychology, May 2018

PROFESSIONAL POSITIONS

Assistant Professor, Department of Statistics, VIRGINIA TECH — 2025 - Present
Assistant Professor, Department of Statistics, NC STATE UNIVERSITY — 2023 - 2024

HONORS & AWARDS

ISBA Savage Award Finalist; 2023
Shewell Award for presentation at Fall Technical Conference; 2023
Mary G. and Joseph Natrella Scholarship; 2022
ASA Physical and Engineering Sciences Section Student Paper Competition Winner; 2022
ISBA Best Student/Postdoc Contributed Paper Award; 2021
ISBA Industrial Statistics Student Presentation Award, Honorable Mention; 2021
Virgina Tech Myers Award for excellence in linear models and design of experiments; 2019
Virginia Tech Boyd Harshbarger Award for excellence as a first-year graduate student; 2019
Virginia Tech Jean D. Gibbons Fellowship; 2018
Auburn University Dean's Medal in Mathematics; 2018
Auburn University Dean's Award for Academic Excellence; 2018

IN REVIEW

Cooper, A., **Booth, A. S.**, & Gramacy, R. B. (2025). Modernizing full posterior inference for surrogate modeling of categorical-output simulation experiments. arXiv:2501.14946

Booth, A. S. & Renganathan, S. A. (2025). Two-stage design for failure probability estimation with Gaussian process surrogates. arXiv:2410.04496

Wycoff, N., Smith, J. W., **Booth, A. S.**, & Gramacy, R. B. (2024). Voronoi candidates for Bayesian optimization. arXiv:2402.04922

Moran, K. R., Payne, R., Lawrence, E., Higdon, D., Walsh, S. A., **Booth, A. S.**, Kwan, J., Day, A., Habib S. & Heitmann, K. (2024). Bayesian deep process convolutions: An application in cosmology. arXiv:2411.14747

PEER-REVIEWED PAPERS

Barnett, S., Beesley, L. J., **Booth, A. S.**, Gramacy, R. B., & Osthus, D. (2024). Monotonic warpings for additive and deep Gaussian processes. *Statistics and Computing, to appear*. arXiv:2408.01540

Booth, A. S., Renganathan, S. A., & Gramacy, R. B. (2025). Contour location for reliability in airfoil simulation experiments using deep Gaussian processes. *Annals of Applied Statistics, 19*(1), 191-211. arXiv:2308.04420

Sauer, A., Cooper, A., & Gramacy, R. B. (2023). Vecchia-approximated deep Gaussian processes for computer experiments. *Journal of Computational and Graphical Statistics, 32*(3), 824-837. arXiv:2204.02904

Gramacy, R. B., **Sauer, A.**, & Wycoff, N. (2022). Triangulation candidates for Bayesian optimization. *Advances in Neural Information Processing Systems (NeurIPS), 35,* 35933-35945. arXiv:2112.07457

Sauer, A., Gramacy, R. B., & Higdon, D. (2021). Active learning for deep Gaussian process surrogates. *Technometrics, 65*(1), 4-18. arXiv:2012.08015

OTHER PUBLICATIONS

Booth, A. S., Gramacy, R. B., & Renganathan A. (2024). Actively learning deep Gaussian process models for failure contour and reliability estimation. In *AIAA Scitech 2024 Forum* (p.0577).

Booth, A. S., Cooper, A., & Gramacy, R. B. (2024). Nonstationary Gaussian process surrogates. *Handbook of Uncertainty Quantification, to appear*; arXiv:2305.19242

Sauer, A. (2022). `deepgp`: an R-package for Bayesian deep Gaussian processes. *ISBA Bulletin*, Software Highlight; December, 29(4).

Sauer, A. & Gramacy R. B. (2022). Discussion of paper by Marmin & Filippone. An invited discussion of "Deep Gaussian processes for calibration of computer models" by S. Marmin & M. Filippone. *Bayesian Analysis*, pp. 1-30.

Stanford, B., **Sauer, A.**, Jacobson, K., & Warner, J. (2022). Gradient-enhanced reliability analysis of transonic aeroelastic flutter. In *AIAA Scitech 2022 Forum* (p. 0632).

THESIS

Ph.D. Thesis, Department of Statistics. *Deep Gaussian Process Surrogates for Computer Experiments* (2023). Virginia Polytechnic Institute and State University; *http://hdl.handle.net/10919/114845*

OPEN SOURCE SOFTWARE

`deepgp`: An R–package for deep Gaussian processes using fully-Bayesian MCMC. *https://CRAN.R-project.org/package=deepgp*

`runexp`: An R–package for softball run expectancy using discrete Markov chains and Monte Carlo simulation; with S. Merkes. *https://CRAN.R-project.org/package=runexp*

GRANTS

Lawrence Livermore National Laboratory, Academic Collaboration Team: Dimension reduction with deep Gaussian process models [PI] Awarded in December 2024 for 3 years, with Kevin Quinlan and Laura Wendelberger. $258,446

National Science Foundation (NSF), Collaborative Research: MATH-DT: *Gradient-enhanced deep Gaussian processes for optimization of diffusive high-speed unsteady mixers* [PI] Awarded in August 2024 for 3 years, with James Braun. $498,290

NCSU Controlled Environment Agriculture Consortium: *Computational fluid dynamics for enhanced understanding of air movement, sensor placement, and plant arrangement in controlled environment agriculture* [PI] Awarded in June 2024 for 1 year, with James Braun and Ricardo Hernandez. $25,000

TALKS & SEMINARS

Key: **S** ≡ Seminar ≈ 60m; **IT** ≡ Invited Talk ≈ 30m; **CT** ≡ Contributed Talk ≈ 20m; **P** ≡ Poster

Hybrid Monte Carlo for Failure Probability Estimation

S	Feb 2025	**IMSI Workshop on UQ for Digital Twins**, Chicago, IL
S	Feb 2025	**Insper (São Paulo, Brazil)**, virtual
CT	Oct 2024	**Adv. in Interdisciplinary Statistics and Combinatorics**, Greensboro, NC

Contour location using deep Gaussian processes

S	Nov 2024	**Chemical and Process Industries Division Webinar**, virtual
IT	May 2024	**Design and Analysis of Experiments Conference**, Blacksburg, VA
S	Mar 2024	**Arizona State University Fireside Chat**, virtual
CT	Jan 2024	**AIAA Scitech Forum**, Orlando, FL
IT	Oct 2023	**Fall Technical Conference**, Raleigh, NC
S	Sep 2023	**Duke University**, Durham, NC
S	July 2023	**NASA NSET Meeting**, virtual

Deep Gaussian process surrogates

S	Mar 2025	**Virginia Tech National Security Institute**, Blacksburg, VA
IT	July 2024	**ISBA World Meeting**, Venice, Italy
S	Mar 2024	**ASA Section on Defense and National Security Webinar**, virtual
CT	Feb 2024	**SIAM Conference on UQ**, Trieste, Italy
S	Jan 2023	**Baylor University**, Waco, TX
S	Jan 2023	**North Carolina State University**, Raleigh, NC
S	Jan 2023	**University of Virginia**, Charlottesville, VA
S	Dec 2022	**National Institute of Standards and Technology**, Gaithersburg, MD
S	Dec 2022	**University of Florida**, Gainesville, FL
S	Nov 2022	**The Ohio State University**, Columbus, OH
S	Nov 2022	**University of South Carolina**, Columbia, SC

Vecchia-approximated deep Gaussian processes for computer experiments

IT	Aug 2024	**Joint Statistical Meetings**, Portland, OR
IT	May 2023	**Spring Research Conference**, Banff, Alberta, Canada
IT	Aug 2022	**Joint Statistical Meetings**, Washington, D.C.
IT	Jun 2022	**Quality and Productivity Research Conference**, virtual
CT	Apr 2022	**SIAM Conference on Uncertainty Quantification**, virtual
CT	May 2022	**Spring Research Conference**, virtual

Active learning for deep Gaussian process surrogates

IT	Oct 2022	**Fall Technical Conference**, Park City, UT
CT	Oct 2022	**Adv. in Interdisciplinary Statistics and Combinatorics**, Greensboro, NC
P	Oct 2022	**Virginia Tech Corporate Partners Conference**, Blacksburg, VA
P	Aug 2022	**IMSI Workshop on Gaussian Processes**, Chicago, IL
CT	Feb 2022	**SIAM Conference on Parallel Processing for Scientific Computing**, virtual
CT	Oct 2021	**Virginia Tech Corporate Partners Conference**, Blacksburg, VA
CT	Oct 2021	**INFORMS Annual Meeting**, virtual
S	Oct 2021	**Virginia Tech Deptartment of Statistics Colloquium**, virtual
IT	Aug 2021	**Joint Statistical Meetings**, virtual
CT	Jul 2021	**ISBA World Meeting**, virtual
S	Mar 2021	**Virginia State University**, virtual
CT	Oct 2020	**Virginia Tech Corporate Partners Conference**, virtual

OTHER EMPLOYMENT

NASA LANGLEY RESEARCH CENTER: graduate research assistant; May - December 2021

EASTMAN CHEMICAL COMPANY: applied statistics intern; May - August 2019

OTHER RESEARCH EXPERIENCE

VIRGINIA TECH SOFTBALL: senior analyst. Applying Markov chain theory and Monte Carlo simulation to advise coaching decisions; 2019 - 2020

VIRGINIA TECH STATISTICAL APPLICATIONS AND INNOVATIONS GROUP: lead consultant. Providing statistical consulting to graduate students and faculty; 2019 - 2020

LECTURING

ST 370 PROBABILITY AND STATISTICS FOR ENGINEERS, NC STATE UNIVERSITY: undergraduate calculus-based introductory statistics course covering probability, estimation, hypothesis testing, regression, and analysis of variance with applications various engineering fields. Bi-weekly 75-minute lectures; Fall 2023 & Fall 2024.

STAT 4714 PROBABILITY AND STATISTICS FOR ELECTRICAL ENGINEERS, VIRGINIA TECH: undergraduate introductory statistics course covering probability, random varialbes, estimation, hypothesis testing, regression, and analysis of variance with applications in electrical engineering. Six-week online course; Summer 2023. Tri-weekly 50 minute lectures; Spring 2025.

STAT 3615 BIOLOGICAL STATISTICS, VIRGINIA TECH: undergraduate introductory statistics course covering descriptive and inferential statistics with applications to biological sciences. Bi-weekly 75-minute lectures; Fall 2019 & Fall 2022.

SERVICE

ASA Section on Physical and Engineering Sciences Council of Sections Representative; 2025
Reviewer on an NSF Division of Mathematical Sciences panel; 2024
CPID Fall Technical Conference Program Representative; 2024 - 2025
Associate Editor, *Technometrics*; 2023 - Present
Virginia Tech Corporate Partners Committee; 2019-2021
Mu Sigma Rho, Vice President of Virginia Tech Chapter; 2020-2022

PROFESSIONAL MEMBERSHIP

American Statistical Association, Section on Physical and Engineering Sciences; 2021 - Present
International Society for Bayesian Analysis; 2021 - Present