

ANNIE SAUER BOOTH

CONTACT INFO	Department of Statistics Virginia Tech Hutcheson Hall, 250 Drillfield Drive Blacksburg, VA 24061, USA	<i>E-mail:</i> annie_booth@vt.edu <i>Homepage:</i> www.anniesbooth.com
RESEARCH INTERESTS	The design and analysis of computer experiments including nonstationary surrogates, uncertainty quantification, active learning, optimization, calibration, and reliability.	
EDUCATION	VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY Ph.D. Statistics, May 2023, advised by Robert B. Gramacy & David Higdon Dissertation: <i>Deep Gaussian Process Surrogates for Computer Experiments</i> 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 Assistant Professor , Department of Statistics, NC STATE UNIVERSITY	2025 - Present 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 Virginia 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	Prim, S., Quinlan, K. R., Hawkins, P., Movva, J., & Booth, A. S. (2025). Actively learning joint contours of multiple computer experiments. arXiv:2512.13530 Mutoh, A., Booth, A. S. , & Stallrich, J. W. (2025). Revisiting penalized likelihood estimation for Gaussian processes. arXiv:2511.18111 Walsh, S. A., Booth, A. S. , Higdon, D., Clark, J., Moran, K. R., & Heitmann, K. (2025). Bayesian deep Gaussian processes for correlated functional data: A case study in cosmological matter power spectra. arXiv:2507.18683	

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

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

Booth, A. S. & Renganathan, S. A. (2025). Two-stage design for failure probability estimation with Gaussian process surrogates. *Journal of Quality Technology, just accepted*. arXiv:2410.04496

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

Barnett, S., Beesley, L. J., **Booth, A. S.**, Gramacy, R. B., & Osthuis, 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. <i>Deep Gaussian Process Surrogates for Computer Experiments</i> (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: <i>Gradient-enhanced deep Gaussian processes for optimization of diffusive high-speed unsteady mixers</i> [PI] Awarded in August 2024 for 3 years, with James Braun. \$498,290
	NCSU Controlled Environment Agriculture Consortium: <i>Computational fluid dynamics for enhanced understanding of air movement, sensor placement, and plant arrangement in controlled environment agriculture</i> [Co-PI] Awarded in June 2024 for 1 year, with James Braun and Ricardo Hernandez. \$25,000
TALKS & SEMINARS	<i>Key:</i> S ≡ Seminar ≈ 60m; IT ≡ Invited Talk ≈ 30m; CT ≡ Contributed Talk ≈ 20m; P ≡ Poster
	<u>Two-stage design for failure probability estimation with Gaussian process surrogates</u>
	IT Oct 2025 Fall Technical Conference , Houston, TX
	IT June 2025 Spring Research Conference , New York, NY
	S May 2025 IMSI Workshop on UQ and ML for Complex Physical Systems , Chicago, IL
	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
	<u>Contour location using deep Gaussian processes</u>
	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

IT	Aug 2025	Joint Statistical Meetings , Nashville, TN
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 Department 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	<p>STAT 5014 INTRODUCTION TO STATISTICAL PROGRAMMING PACKAGES, VIRGINIA TECH: graduate course for statistics majors introducing computing and statistical programming. Weekly 50-minute lectures; Fall 2025.</p> <p>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.</p> <p>STAT 4714 PROBABILITY AND STATISTICS FOR ELECTRICAL ENGINEERS, VIRGINIA TECH: undergraduate introductory statistics course covering probability, random variables, 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.</p> <p>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.</p>
SERVICE	<p>Fall Technical Conference Chair; 2026</p> <p>ASA Section on Physical and Engineering Sciences Council of Sections Representative; 2025</p> <p>Two-time panelist for NSF Division of Mathematical Sciences; 2024 and 2025</p> <p>CVID Fall Technical Conference Program Representative; 2024 - 2025</p> <p>Associate Editor, <i>Technometrics</i>; 2023 - Present</p> <p>Virginia Tech Corporate Partners Committee; 2019-2021</p> <p>Mu Sigma Rho, Vice President of Virginia Tech Chapter; 2020-2022</p>
PROFESSIONAL MEMBERSHIP	<p>American Statistical Association, Section on Physical and Engineering Sciences; 2021 - Present</p> <p>International Society for Bayesian Analysis; 2021 - Present</p>