ANNIE SAUER BOOTH

CONTACT INFO

Department of Statistics
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RESEARCH INTERESTS

Bayesian statistics, surrogate modeling, statistical computing, sequential design, 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, NC State University 2023 - Present

HONORS & AWARDS

Finalist for the ISBA Savage Award; 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

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

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

Booth, A. S., Renganathan, S. A., & Gramacy, R. B. (2024). Contour location for reliability in airfoil simulation experiments using deep Gaussian processes. arXiv:2308.04420

PEER-REVIEWED PAPERS

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).

Sauer, A., Cooper, A., & Gramacy, R. B. (2023). Non-stationary Gaussian process surrogates. *chapter in 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

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 co-PI 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* [co-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

Contour location using deep Gaussian processes

IT	May 2024	**Design & 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	July 2024	**ISBA World Meeting**, Venice, Italy
S	Mar 2024	**ASA Section on Defense & 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 & 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	**Advances in Interdisciplinary Statistics and Combinatorics**, Greensboro, NC
P	Oct 2022	**Virginia Tech Corporate Partners Conference**, Blacksburg, VA
P	Aug 2022	**IMSI Conference 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.

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.

OTHER TEACHING EXPERIENCE

STAT 2004 INTRODUCTORY STATISTICS, VIRGINIA TECH: introductory statistics course for non-STEM majors. Teaching Assistant and Recitation Leader under Hamdy Mahmoud; Fall 2018 & Spring 2019

STAT 3615 BIOLOGICAL STATISTICS, VIRGINIA TECH: undergraduate introductory statistics course. Teaching Assistant under Frances McCarty; Fall 2018

VIRGINIA TECH STATISTICAL APPLICATIONS AND INNOVATIONS GROUP SHORT COURSES: instructing single-day courses in statistical methods and programming; 2019 - 2020

SERVICE

Reviewer on an NSF Division of Mathematical Sciences panel; 2024
CPID Fall Technical Conference Program Representative; 2024
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