

JOSEPH GUINNESS

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Associate Professor
Director of Undergraduate Studies
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ADDRESS

Cornell University
1178 Comstock Hall
Ithaca, NY, 14853 USA

EDUCATION

2003 - 2007 Washington University in St. Louis, B.A. in Mathematics and Physics
2007 - 2012 University of Chicago, Ph.D. in Statistics

EMPLOYMENT

2012 - 2014 NC State University, Department of Statistics, Postdoctoral Scholar
2014 - 2018 NC State University, Department of Statistics, Assistant Professor
2017 - 2018 Cornell University, Department of Biological Statistics and Computational Biology,
Visiting Assistant Professor
2018 - 2020 Cornell University, Department of Statistics and Data Science, Assistant Professor
2020 - Cornell University, Department of Statistics and Data Science, Associate Professor

ADMINISTRATIVE SERVICE

2022 - Director of Undergraduate Studies
Department of Statistics and Data Science, Cornell University

EDITORIAL SERVICE

2019 - Associate Editor, Journal of Agricultural, Biological, and Environmental Statistics
2019 - Associate Editor, Journal of Computational and Graphical Statistics
2022 - Associate Editor, Journal of Data Science in Science

PUBLICATIONS

Under Review

Sparse Cholesky factorization by greedy conditional selection

Stephen Huan, Joseph Guinness, Matthias Katzfuss, Houman Owhadi, Florian Schäfer
Under Review, [Preprint](#)

A Gaussian-process approximation to a spatial SIR process using moment closures and emulators

Parker Trostle, Joseph Guinness, Brian Reich
Under Review, [Preprint](#)

Estimating Atmos. Motion Winds from Satellite Image Data using Space-Time Drift Models
Indranil Sahoo, Joseph Guinness, Brian Reich
Under Review, [Preprint](#)

Published

Comparison of CYGNSS and Jason-3 Wind Speed Measurements via Gaussian Processes
William Bekerman, Joseph Guinness
[Journal of Data Science in Science, Preprint](#)

Vecchia's Approximation and Optimization for Multivariate Matérn Models
Youssef Fahmy, Joseph Guinness
[Journal of Data Science \(Preprint\)](#)

Log-Gaussian Cox process modeling of large spatial lightning data using spectral and Laplace approx.
Megan Gelsinger, Maryclare Griffin, Joseph Guinness, David Matteson
[Annals of Applied Statistics, Preprint](#)

Informing Surveillance through the Characterization of Outbreak Potential of Chronic Wasting Disease in White-Tailed Deer
Hanley, Carstensen, Walsh, Christensen, Storm, Booth, Guinness, Them, Ahmed, Schuler
[Ecological Modelling](#)

Scalable Gaussian-process regression and variable selection using Vecchia approximations
Jian Cao, Joseph Guinness, Marc Genton, Matthias Katzfuss
[Journal of Machine Learning Research \(Preprint\)](#)

Ordered Conditional Approximations of Potts Models
Aniban Chakraborty, Matthias Katzfuss, Joseph Guinness
[Spatial Statistics \(Preprint\)](#)

Scaled Vecchia Approximation for Fast Computer Model Emulation
Matthias Katzfuss, Joseph Guinness, Earl Lawrence
[SIAM/ASA Journal on Uncertainty Quantification \(Preprint\)](#)

Spatial statistical modeling of arsenic accumulation in microsites of diverse soils
Aakriti Sharma, Joseph Guinness, Amanda Muyskens, Matthew Polizzotto, Montserrat Fuentes, Dean Hesterberg
[Geoderma](#)

Partition-Based Non-Stationary Covariance Estimation using the Stochastic Score Approx.
Amanda Muyskens, Joseph Guinness, Montserrat Fuentes
[Journal of Computational and Graphical Statistics, Preprint](#)

Corn Grain Yield Pred. and Mapping from Unmanned Aerial System Multispectral Imagery
Sunoj Shajahan, Cho, Guinness, van Aardt, Czymmek, Ketterings
[Remote Sensing](#)

Proposed Method for Statistical Analysis of On-Farm Single Strip Treatment Trials
Jason Cho, Guinness, Kharel, Maresma, Czymmek, van Aardt, Ketterings
[Agronomy](#)

Spatial Shrinkage via the Product Independent Gaussian Process Prior
Arkaprava Roy, Brian Reich, Joseph Guinness, Russel Shinohara, Ana-Maria Staicu

Journal of Computational and Graphical Statistics, Preprint

Estimating Agronomically Relevant Symbiotic N Fixation in Green Manure Breeding Pgms

Katherine Muller, Joseph Guinness, Matthew Hecking, Laurie Drinkwater

Crop Science

Inverses of Matérn Covariances on Grids

Joseph Guinness

Biometrika, Preprint

Spatial Estimation Methods for Mapping Corn Silage and Grain Yield Monitor Data

Jason Cho, J. Guinness, Tulsi Kharel, S Sunoj, Dilip Kharel, E. Oware, J. van Aardt, Q. Ketterings

Precision Agriculture

Gaussian Process Learning via Fisher Scoring of Vecchia's Approximation

Joseph Guinness

Statistics and Computing, Preprint

Nonparametric Spectral Methods for Multivariate Spatial and Spatial-Temporal Data

Joseph Guinness

Journal of Multivariate Analysis, Preprint

Geostatist. Modeling of Positive-Definite Matrices: Application to Diffusion Tensor Imaging

Zhou Lan, Brian Reich, Joseph Guinness, Dipankar Bandyopadhyay, Liangsuo Ma, F. Gerard Moeller

Biometrics

An Observational Study of the Effect of Vaporfly Shoes on Marathon Performance

Joseph Guinness, Debasmita Bhattacharya, Jenny Chen, Max Chen, Angela Loh

Researchers One

Vecchia Approximations for Gaussian Process Predictions

Matthias Katzfuss, Joseph Guinness, Wenlong Gong

Journal of Agricultural, Biological and Environmental Statistics, Preprint

Baseline Drift Estimation for Air Quality Data Using Quantile Trend Filtering

Halley Brantley, Joseph Guinness, Eric Chi

Annals of Applied Statistics, Preprint

A General Framework for Vecchia Approximations of Gaussian Processes

Matthias Katzfuss and Joseph Guinness

Statistical Science, Preprint

Smooth Density Spatial Quantile Regression

Halley Brantley, Montserrat Fuentes, Joseph Guinness, Eben Thoma

Statistica Sinica, Preprint

Multi-element Effects on Arsenate Accumulation in a Geochemical Matrix Determined Using μ -XRF, μ -XANES, and Spatial Statistics

Sharma, Bell, Guinness, Polizzotto, Fuentes, Tappero, Chen-Weigart, Thieme, Williams, Hesterberg

Journal of Synchrotron Radiation

Characterizing Determinants of Near-Road Ambient Air Quality for an Urban Intersection and a Freeway Site

H. Christopher Frey, Andrew P. Grieshop, Andrey Khlystov, John J. Bang, Nagui Roupail, Joseph Guinness, Daniel Rodriguez, Montse Fuentes, Provat Saha, Halley Brantley, Michelle Snyder, Shams Tanvir, Kwanpyo Ko, Theophraste Noussi, Maryam Delavarrafiee, and Sanjam Singh

Research Reports of the Health Effects Institute

Improved methods for Earth system modelling of atmos. soluble iron and obs. comparisons
Hamilton, Scanza, Guinness, Kok, Longlei, Mingxuan, Rathod, Wan, Xiaohong, Fan, Mahowald
Geoscientific Model Development

A space-time geostat. model for prob. est. of harmful algal bloom biomass and areal extent
Fang, Giudice, Scavia, Binding, Bridgeman, Chaffin, Evans, Guinness Johengen, Obenour
Science of the Total Environment

A Case Study Competition among Methods for Analyzing Large Spatial Data
Heaton, Datta, Finley, Furrer, Guhaniyogi, Gerber, Gramacy, Guinness, Hammerling, Katzfuss, Lindgren, Nychka, Sun, Zammit-Mangion
Journal of Agricultural, Biological, and Environmental Statistics Preprint

Space-Time Geostatistical Assessment of Hypoxia in the Northern Gulf of Mexico
V. Rohith Reddy Matli, Fang, Guinness, Rabalais, Craig, Obenour
Environmental Science and Technology, 2018

Spectral Density Estimation for Random Fields via Periodic Embeddings
Joseph Guinness
Biometrika, 2019, Preprint

A Test for Isotropy on the Sphere using Spherical Harmonic Functions
Indranil Sahoo, Joseph Guinness, Brian Reich
Statistica Sinica, 2019, Preprint
* Winner of 2018 JSM ENVR Student Paper Award

Permutation and Grouping Methods for Sharpening Gaussian Process Approximations
Joseph Guinness
Technometrics, 2018, Preprint
* Winner of Wilcoxon Award

Fully Bayesian Spectral Methods for Imaging Data
Brian Reich, Joseph Guinness, Simon Vandekar, Russel T Shinohara, Ana-Maria Staicu
Biometrics, 2018, Preprint

Compression and Conditional Emulation of Climate Model Output
Joseph Guinness and Dorit Hammerling
JASA Applications and Case Studies, 2018, Preprint

Optimal Seed Deployment under Climate Change using Spatial Models: Application to Loblolly Pine in the Southeastern US
Alfredo Farjat, Brian Reich, Joseph Guinness, Ross Whetten, Steve McKeand, Fikret Isik
JASA Applications and Case Studies, 2017, Preprint

An Evolutionary Spectrum Approach for Modeling Land/Ocean Nonstationarities
Stefano Castruccio and Joseph Guinness
Journal of the Royal Statistical Society, Series C, 2017, Preprint

Isotropic covariance functions on spheres: some properties and modeling considerations
Joseph Guinness and Montserrat Fuentes
Journal of Multivariate Analysis, 2016, Preprint

Circulant embedding of approximate covariances for inference from Gaussian data on large lattices

Joseph Guinness and Montserrat Fuentes
[Journal of Computational and Graphical Statistics](#), 2017, [Preprint](#)

Likelihood approximations for big nonstationary spatial-temporal lattice data
Joseph Guinness and Montserrat Fuentes
[Statistica Sinica](#), 2015, [Preprint](#)

Multivariate spatial modeling of cond. dep. in microscale soil elemental composition data
Joseph Guinness, Montserrat Fuentes, Dean Hesterberg, and Matthew Polizzotto
[Spatial Statistics](#), 2014, [Preprint](#)

Interpolation of nonstationary high frequency spatial-temporal temperature data
Joseph Guinness and Michael Stein
[Annals of Applied Statistics](#), 2013, [Preprint](#)

Transformation to approximate independence for locally stationary Gaussian processes
Joseph Guinness and Michael Stein
[Journal of Time Series Analysis](#), 2013, [Preprint](#)

SOFTWARE

GpGp R Package, available on the [CRAN](#) and [github](#)

TEACHING AND RESEARCH VIDEOS

[Youtube Channel](#)

RECENT INVITED PRESENTATIONS

- 2023 Cornell Statistics Seminar
 CAMDA Conference at Texas A&M
 Indian Statistical Association Annual Conference at Colorado School of Mines
- 2022 Maastricht University Econometrics Seminar
 UC Davis Department of Statistics Seminar
 Joint Statistical Meetings
 Rice University Statistics Seminar
- 2021 Spatial and Temporal Statistics Symposium (U of Wollongong)
 Arizona State Department of Statistics Seminar
 Geostatistics Days 2021 (Fontainebleau, France)
- 2020 Brazilian Synchrotron Light Laboratory Seminar
 “Statistical Analysis of Multi-Element Micro-XRF Data”
 Lancaster Workshop on Time Series and Spatial Statistics
 “Nonparametric Spectral Methods for Multivariate Spatial and Spatial-Temporal Data”
 EPFL Statistics Seminar
 “Inverses of Matern Covariances on Grids”
 Joint Statistical Meetings
 “Inverses of Matern Covariances on Grids”
 Los Alamos Statistics Seminar

- “Vecchia’s Gaussian Process Approximation”
- 2019 Cornell Atmospheric Sciences Seminar
 “Spatial Temporal Statistical Methods for Earth Science Data”
- IMS/ASA Spring Research Conference
 “Nonparametric Spectral Methods for Multivariate Spatial and Spatial-Temporal Data”
- ASA CSSA SSSA Annual Meeting
 “Using Spatial Statistics to Analyze on-Farm Trials”
- Cornell Day of Statistics
 “Spectral Methods for Multivariate Spatial and Spatial-Temporal Data”
- 2018 Penn State Dept. of Statistics Seminar
 “Statistical Compression of Climate Model Output”
- Joint Statistical Meetings
 “Fully Bayesian Spectral Methods for Imaging Data”
- Notre Dame University Statistics Seminar
 “Spectral Density Estimation for Random fields via Periodic Embeddings”
- Virginia Tech Statistics Seminar
 “Spectral Density Estimation for Random fields via Periodic Embeddings”

FUNDING

NSF-DMS - *Collaborative Research: Scalable Gaussian-Process Methods for Spatial Statistics and Machine Learning*

PI: Joseph Guinness, Collaborating PI: Matthias Katzfuss, Texas A&M

Total Funding: \$100,000 over 2020-2023

NSF-DMS - *Spatial-Temporal Modeling and Computation for Physical Processes and Num. Simulations*

PI: Joseph Guinness

Total Funding: \$220,000 over 2019-2022

NSF-DMS - *Estimation and Inference for Massive Multivariate Spatial Data*

PI: Joseph Guinness

Total Funding: \$160,000 over 2016-2019

NSF-DMS - *Spatial-temporal models and methods for big nonstationary multivariate data on Euclidean spaces and the sphere*

PI: Montserrat Fuentes, Co-PIs: Joseph Guinness, Lian Xie (Dept. of MEAS, NCSU)

Total Funding: \$210,000 over 2014-2017

NIH-NIEHS - *R01 - Data Integration Methods for Environmental Exposures with Application in Air Pollution and Asthma Morbidity*

PI: Howard Chang, Emory University, NCSU Co-PIs: Joseph Guinness, Brian Reich

Total Funding: \$607,565 over 2017-2022

NCSU Research Innovation Seed Funding - *Nanoscale Dynamics of Phosphate and Arsenate Reactions Affecting Soil Regulation of Plant Nutrition and Environmental Toxicity*

PI: Dean Hesterberg, Co-PIs: Joseph Guinness, James LeBeau

Total Funding: \$25,000 over 2018-2019

Health Effects Institute - *Characterizing the Determinants of Vehicle Traffic Emissions Exposure: Measurement and Modeling of Land-Use, Traffic, Emissions, Transformation and Transport*

PI: Henry Chris Frey, Co-PIs: Montserrat Fuentes, Joseph Guinness, Andrew Grieshop, Nagui Roupail, Daniel Rodriguez, Andrey Khlystov

Total Funding: \$761,681 over 2014-2017

AWARDS

2023 Teaching and Advising Excellence Award Cornell Bowers College of Computing and Info Science
Early Investigator Award, Environmental Statistics (ENVR) Section of American Statistical Association
Wilcoxon Award, for best applied paper in 2018 issues of *Technometrics*
Martin Silverstein Award, Washington University Department of Mathematics

STUDENT MENTORING (current in bold)

Ph.D. Advisor or Co-Advisor

Youssef Fahmy, Cornell Statistics Ph.D. student
Zachary James, Cornell Statistics Ph.D. student
Megan Gelsinger, Cornell Statistics Ph.D. 2021
Halley Brantley, NCSU Statistics Ph.D. 2019
Amanda Muyskens, NCSU Statistics Ph.D. 2019
Indranil Sahoo, NCSU Statistics Ph.D. 2018
Marcela Alfaro-Córdoba, NCSU Statistics Ph.D. 2017
Geoffrey Peterson, NCSU Statistics Ph.D. 2016

Ph.D. Committe Member

Mark Buckner, Cornell Entomology Ph.D. Student
Wangda Zhu, Cornell Design and Environmental Analysis Ph.D. Student
Hanxue Wei, Cornell Regional Science Ph.D. Student
I-An Su, Cornell Human Development Ph.D. Student
Luke Qian, Cornell Food Science Ph.D. Student
Sebastian Llanos Soto, Cornell Veterinary Medicine Ph.D. Student
Colin Bundschu, Cornell Applied Physics Ph.D. student
Sander Aarts, Cornell Operations Research Ph.D. student
Sriya Sunil, Cornell Food Science Ph.D. student
Moshood Bakare, Cornell Plant Breeding Ph.D. student
Nicolas Morales, Cornell Plant Genetics Ph.D. 2022
Yang Liu, Cornell Statistics Ph.D. 2020
Xia Sun, NCSU Department of Marine, Earth, and Atmospheric Sciences Ph.D. student
Shiqi Fang, NCSU Department of Civil, Construction, & Environmental Engineering Ph.D. student
Aakriti Sharma, NCSU Department of Crop and Soil Sciences Ph.D. 2019
Dianna Francisco, NCSU Department of Marine, Earth, and Atmospheric Sciences Ph.D. 2019
Omer Kara, NCSU Department of Agricultural and Resource Economics Ph.D.
Sajeesh Kulappurath, NCSU College of Textiles Ph.D.
Alex Larsen, NCSU Department of Statistics Ph.D.
Munir Winkel, NCSU Department of Statistics Ph.D.
Alfredo Farjat, NCSU Statistics Ph.D.
Rodrigo de la Fuente, NCSU Industrial Engineering Ph.D.

Undergraduate Research Mentor

Robert Feldstein, Cornell
Oana Mirestean, Cornell
Will Bekerman, Cornell
Anna Halldorsdottir, Cornell
Max Chen, Cornell

Jenny Chen, Cornell
Angela Loh, Cornell
Debasmita Bhattacharya, Cornell
Katherine Faiola, Cornell Statistics
Youssef Fahmy, Cornell Statistics
Atreya Iyer, Cornell Statistics
Sulaimon Kassim, NCSU Environmental Sciences
Kristie Kusibab, NCSU Statistics
Claudia Mesa, NCSU Statistics

CONSULTING

Faculty consultant for Cornell Statistical Consulting Unit, 2018 -

SERVICE

Director of Undergraduate Studies for Biometry and Statistics and Statistical Science majors
Cornell CIS Building Committee
Cornell Statistics and Data Science Graduate Curriculum Committee
Cornell Statistics and Data Science Computing Committee
Cornell Statistics and Data Science Faculty Search Committee
NSF Proposal Review Panel for Computation and Data Enabled Science Program
Organizer for Institute of Mathematics and its Applications Workshop, April 2018
NSF Proposal Review Panel for Statistics Program
ASA ENVR Student Paper Award Committee
Cornell CALS College Curriculum Committee
Cornell Statistics Ph.D. admissions committee
NCSU Statistics Head Search Committee
Local organizing committee for 2016 SAMSI ASTRO Program
Founder of NCSU *Spatial Statistics Reading Group*
Organizer for JSM 2015 Invited Poster Session
Organizer for JSM 2016 Invited Session on Statistical Climatology
NCSU Statistics Faculty Search Committee
NCSU Statistics Beach Trip Planning Committee
NCSU Statistics Big Data Committee
NCSU Statistics Seminar Committee
NCSU Statistics Qualifying Exam Committee