

Josh Jacobson

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Research Interests

Spatial ecology • Spatiotemporal statistics • Bayesian hierarchical modeling • Joint species distribution modeling • Forest ecology, dynamics, and biodiversity • Animal movement • Approximate Bayesian computation • Extreme-value theory • Ecosystem responses to environmental change

Education

- 2020–present **Ph.D., Applied Statistics**
University of Wollongong Wollongong, NSW
Thesis: Statistical Methods for the Joint Prediction of Environmental Processes from Remote Sensing Data
Advisors: Noel Cressie and Andrew Zammit Mangion
- 2018–2020 **M.S., Applied Mathematics**
University of Colorado Boulder, CO
Thesis: Verification of Spatial Structure in Ensembles of Forecast Fields
Advisors: Will Kleiber and Michael Scheuerer
- 2015–2019 **B.S., Applied Mathematics**
University of Colorado Boulder, CO
Minors: Computer Science, Atmospheric & Oceanic Sciences

Experience

- 2021–present **Graduate Research Assistant**
Centre for Environmental Informatics, University of Wollongong Wollongong, NSW
Updated the group's CO₂ flux-inversion framework for compatibility with different atmospheric transport models; translated technical research articles into public-facing content.
- 2021–2023 **Data Science Consultant**
Jupiter Intelligence Boulder, CO
Developed a non-stationary Bayesian copula model for analysis of multivariate extreme events; identified and implemented an approximate Bayesian computation algorithm suitable for non-stationary data; collaborated as a core developer of a proprietary Python package for statistical modeling.
- 2019–2020 **Data Science Consultant**
Jupiter Intelligence Boulder, CO
Contributed to development of a statistical emulator for hydrologic model output using boundary-condition inputs; evaluated the computational efficiency of Julia and Python for vectorized calculation and numerical optimization in distributed, parallel frameworks.
- 2019 **Data Science Intern**
Jupiter Intelligence Boulder, CO
Developed a stochastic generator of physically realistic, multi-decadal sea level rise projections and quantified the model's variability in a Monte Carlo experiment.

2017-2019 **Undergraduate Research Assistant**

Department of Environmental Engineering, University of Colorado Boulder, CO
Developed **Parasol**, a JavaScript library for interactive visualization of tradeoff sets in multi-objective optimization problems, e.g., water resources planning and decision making.

2017 **Data Engineering Intern**

VictorOps Boulder, CO
Developed a proprietary R package to streamline database queries and common data-wrangling operations.

Publications

4. Cressie, N., A. Zammit-Mangion, **J. Jacobson**, and M. Bertolacci (2023). Earth’s CO₂ battle: a view from space. *Significance*, 20, 1, pp. 14–19.
3. Vu, Q., Y. Cao, **J. Jacobson**, A. R. Pearce, and A. Zammit-Mangion (2021). Discussion on “Competition on Spatial Statistics for Large Datasets”. *Journal of Agricultural, Biological and Environmental Statistics*.
2. **Jacobson, J.**, W. Kleiber, M. Scheuerer, and J. Bellier (2020). Beyond univariate calibration: verifying spatial structure in ensembles of forecast fields. *Nonlinear Processes in Geophysics*, 27, 3, pp. 411–427.
1. Raseman, W. J., **J. Jacobson**, and J. R. Kasprzyk (2019). Parasol: an open source, interactive parallel coordinates library for multi-objective decision making. *Environmental Modelling & Software*, 116, pp. 153–163.

Presentations

Conferences & Workshops

- 2023-01 A fully-Bayesian spatial copula model for joint-frequency analysis of extreme events
American Meteorological Society (AMS) 103rd Annual Meeting, Denver, CO, USA
- 2021-07 Multivariate spatial prediction of column-averaged carbon dioxide over North America
Australian Mathematical Sciences Institute (AMSI) Winter School, Virtual
- 2021-07 Spatial prediction of column-averaged carbon dioxide over the globe
Australian and New Zealand Statistical Conference (ANZSC), Virtual
- 2019-12 Improving interpretability of multi-objective tradeoff sets for environmental systems
American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, USA
- 2018-09 Interactive visualizations for multi-objective optimization problems
RMACC HPC Symposium, Boulder, CO, USA

Seminars & Colloquia

- 2023-04 A fully-Bayesian spatial copula model for joint-frequency analysis of extreme events
National Institute for Applied Statistics Research Australia (NIASRA), University of Wollongong, Wollongong, Australia
- 2022-04 Approximate Bayesian computation for non-stationary processes
Jupiter Intelligence, Boulder, CO, USA
- 2019-11 Verification of spatial structure in ensembles of forecast fields
Department of Mathematics, University of Zurich, Zurich, Switzerland
- 2019-08 Uncertainty quantification for sea level rise
Jupiter Intelligence, Boulder, CO, USA

Posters

- 2021-07 Multivariate spatial-dependence modelling with satellite data
Early Career & Student Statisticians Conference, Virtual
- 2020-12 Flexible methodology for hyperlocal flooding risk due to sea level rise
American Geophysical Union (AGU) Fall Meeting, Virtual

Conferences

- 2023-07 The International Environmetrics Society (TIES) 2023 Regional Meeting. Virtual.
- 2023-01 American Meteorological Society (AMS) 103rd Annual Meeting. Denver, CO, USA.
- 2022-06 International Statistical Ecology Conference (ISEC). Virtual.
- 2021-07 Australian and New Zealand Statistical Conference (ANZSC). Virtual.
- 2019-07 Joint Statistical Meetings (JSM). Denver, CO, USA.

Workshops

- 2021-07 “Winter School on Statistical Data Science.” Australian Mathematical Sciences Institute (AMSI). Virtual.

Teaching

- Fall 2023 Tutor, STAT 3/801: Statistical Methods for Data Science, School of Mathematics and Applied Statistics, University of Wollongong
- Spring 2023 Tutor, STAT 3/832: Generalised Linear Models, School of Mathematics and Applied Statistics, University of Wollongong
- Fall 2018 Teaching Assistant, APPM 4/5350: Fourier Series and Boundary Value Problems, Department of Applied Mathematics, University of Colorado
- Fall 2016 Teaching Assistant, CSCI 1320: Introduction to Programming for Engineers, Department of Computer Science, University of Colorado

Service, Leadership, & Synergistic Activities

- 2019 **Radio Show Host**
Department of Applied Mathematics, University of Colorado Boulder, CO
Probably Novel Radio Show and Podcast intends to bring research achievements of STEM undergraduates to the public sphere and make them more accessible to a broad audience.
- 2017–present **Open-Source Developer**
Projects with accepted pull-requests include ArviZ, Parasol, parcoords-es, and Mamba
- 2017–2018 **Resident Advisor**
University of Colorado Boulder, CO
- 2016–2018 **Engineering Honors Program Mentor**
College of Engineering & Applied Science, University of Colorado Boulder, CO

Writing

- 2022-03 “Global CO2 Flux: Bayesian statistical inversion using the WOMBAT framework.”
Centre for Environmental Informatics, University of Wollongong

Honors, Awards, & Fellowships

- 2021 Allison Harcourt Poster Award: 1st, Early Career & Student Statisticians Conference
- 2021 ECSSC 2021 Scholarship, Early Career & Student Statisticians Conference
- 2021 Statistical Data Science Scholarship, Australian Mathematical Sciences Institute (AMSI)
- 2020–2024 University Postgraduate Award, University of Wollongong
- 2020 NPG Paper of the Month Award [2] chosen by Editors of Nonlinear Processes in Geophysics for paper of the month, October, 2020
- 2019 Active Learning Award, College of Engineering and Applied Science, University of Colorado
- 2017 Global Seminar Funding, Engineering Honors Program, University of Colorado
- 2016 Honorable Mention, International Mathematical Contest in Modeling, Consortium for Mathematics and its Applications
- 2015–2019 Dean’s List, University of Colorado
- 2015–2019 Engineering Merit Scholarship, University of Colorado
- 2015–2019 Hale Esteemed Scholar Award, University of Colorado

Professional Memberships

- 2023–present The International Environmetrics Society (TIES)
- 2023–present International Association for Statistical Computing (IASC)
- 2023–present Bernoulli Society (BS)
- 2023–present International Statistical Institute (ISI)
- 2021–present Statistical Society of Australia (SSA)
- 2019–present American Statistical Association (ASA)

Computer Skills

- Advanced Git, L^AT_EX, Linux, Python, R
- Intermediate Julia, Matlab, Shell-scripting

Selected Coursework (* indicates graduate level)

- Probability & Statistics Spatial Statistics*, Statistical Modeling*, Statistical Learning, Mathematical Statistics*, Applied Probability, Markov Processes and Monte Carlo Simulations*, Time Series Analysis*, Experimental Design*
- Applied Mathematics Multivariable Calculus, Differential Equations, Linear Algebra, Numerical Analysis*, Real Analysis, Complex Analysis, Fourier Series and Boundary Value Problems, Data Assimilation*
- Computer Science Data Structures, Computer Systems, Algorithms, Introduction to Data Science
- Physical Science Climate Modeling, Physical Oceanography, Radiative Transfer and Remote Sensing*, Principles of Ecology, Objective Data Analysis*