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 **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.

2021–present **Graduate Research Assistant**
Centre for Environmental Informatics, University of Wollongong   Wollongong, NSW
Updated the group's CO_2 flux-inversion framework for compatibility with different atmospheric transport models; translated technical research articles into public-facing content.

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

In Preparation

- Harr, P., **J. Jacobson**, and S. Sain (2022). A multivariate copula model for compound extreme events.

- **Jacobson, J.**, N. Cressie, and A. Zammit-Mangion (2022). Multivariate spatial prediction of solar-induced chlorophyll fluorescence for OCO-2.

- Sain, S., A. Hoffman, **J. Jacobson**, E. Middlemas, H. Scannell, J. Oyler, M. Zarekarizi, and J. Naviaux (2022). Climate Change, Statistics for.

Published

3. Vu, Q., Y. Cao, **J. Jacobson**, A. R. Pearse, 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, 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

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

| 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

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

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 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

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

2021–present	Statistical Society of Australia (SSA)
2019–present	American Statistical Association (ASA)
2019–present	Society for Industrial and Applied Mathematics (SIAM)

Computer Skills

Basic	JavaScript, Shell-scripting
Intermediate	Julia, LaTeX, Linux, Matlab
Advanced	Git, Python, R

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
Climate Science	Climate Modeling, Physical Oceanography, Radiative Transfer and Remote Sensing*, Objective Data Analysis*