Josh Jacobson

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Research Interests

Spatio-temporal statistics • Bayesian hierarchical modeling • Extreme-value theory
Computational statistics • Climate & environmental applications

Education

2020 – present	**Ph.D., Applied Statistics**	
	University of Wollongong	Wollongong, NSW
	Advisors: Noel Cressie & Andrew Zammit Mangion	
2018 – 2020	**M.S., Applied Mathematics**	
	University of Colorado	Boulder, CO
	Advisors: Will Kleiber & Michael Scheuerer	
2015 – 2019	**B.S., Applied Mathematics**	
	University of Colorado, Graduation with Honors	Boulder, CO
	Minors: Computer Science, Atmospheric & Oceanic Sciences	

Research Experience

2020 – present — **Spatio-temporal statistics and Bayesian inference**
Ph.D. Student, University of Wollongong — Wollongong, NSW
Researched novel statistical methods for spatial and spatio-temporal data problems, with emphasis on hierarchical modeling and Bayesian inference. Leveraged high-performance computing to implement scalable algorithms for large remote-sensing datasets efficiently. Applications include multivariate spatial prediction (cokriging) [4] and spatio-temporal prediction of global carbon-dioxide fluxes at Earth's surface [5, 6].

2020 – 2022 — **Extreme-value analysis and approximate Bayesian computation**
Data Science Consultant, Jupiter Intelligence — Boulder, CO
Developed a Bayesian spatial copula model to analyze multivariate extreme events, with application to wind speed and precipitation data from hurricane simulations. Presented results at the 2023 Annual Meeting of the American Meteorological Society. Separately, implemented an approximate Bayesian computation algorithm for non-stationary data to parallelize inference across distributed computing resources.

2019 – 2020 — **Spatial forecast verification**
Master's Student, University of Colorado — Boulder, CO
Assessed the utility of fractional exceedance histograms in detecting miscalibrated spatial structures within ensemble forecast fields, focusing on downscaled precipitation forecasts. This work was published in *Nonlinear Processes in Geophysics* [2] and was selected for Paper of the Month by the editors.

2017 – 2018 — **High-dimensional visualization**
Undergraduate Apprentice, University of Colorado — Boulder, CO
Authored an interactive parallel coordinates visualization library for tradeoff analysis in multi-objective optimization problems, with application to water resources management. This work was published in *Environmental Modelling & Software* [1].

Publications

In Preparation

- **Jacobson, J.**, M. Bertolacci, A. Zammit-Mangion, and N. Cressie (2024+). Separating natural carbon fluxes using solar-induced fluorescence (SIF) observations in a global Bayesian inversion.

Published

5. Cressie, N., A. Zammit-Mangion, **J. Jacobson**, and M. Bertolacci (2023). Earth's CO_2 battle: a view from space. *Significance*, 20(1), pp. 14–19.

4. **Jacobson, J.**, N. Cressie, and A. Zammit-Mangion (2023). Spatial statistical prediction of solar-induced chlorophyll fluorescence (SIF) from multivariate OCO-2 data. *Remote Sensing*, 15(16), p. 4038.

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*, 26, pp. 614–618.

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.

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
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

Grants

2023 – 2025	NASA Research Opportunities in Space and Earth Science (ROSES): "Hierarchical Spatio-Temporal Statistical Methods for Analyzing OCO-2/3 Data" PI: Michael Bertolacci; Co-PIs: Noel Cressie, Andrew Zammit Mangion, Beata Bukosa; Students: Josh Jacobson, Daemon Kennett, Alan Pearse Award: \$0 (*International organizations are not eligible for cash funding, but the award grants membership of the OCO Science Team.*)

Presentations

Conferences & Workshops

2023-12	Spatial prediction of solar-induced fluorescence (SIF) from multivariate satellite data Australian Statistics Conference, Wollongong, NSW, Australia
2023-10	coSIF: Spatial statistical prediction of SIF from multivariate OCO-2 data NASA OCO Science Team Meeting, Virtual
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

2024-10	A multivariate Bayesian hierarchical model for global CO_2 surface flux American Statistical Association ENVR Workshop, 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

Teaching

Fall 2024	Teaching Assistant, STAT 3/804: Stochastic Processes and Time Series Analysis, University of Wollongong
Spring 2024	Teaching Assistant, STAT 3/832: Generalised Linear Models, University of Wollongong
Fall 2023	Teaching Assistant, STAT 3/801: Statistical Methods for Data Science, University of Wollongong
Spring 2023	Teaching Assistant, STAT 3/832: Generalised Linear Models, University of Wollongong
Fall 2018	Teaching Assistant, APPM 4/5350: Fourier Series and Boundary Value Problems, University of Colorado
Fall 2016	Teaching Assistant, CSCI 1320: Introduction to Programming for Engineers, University of Colorado

Service & Leadership

2024	Postgraduate Seminar Series Head, School of Mathematics and Applied Statistics, University of Wollongong
2019	Radio Show Host, "Probably Novel Podcast," Department of Applied Mathematics, University of Colorado
2016 – 2018	Academic Mentor, Engineering Honors Program, University of Colorado

Computer Skills

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