

Josh Jacobson

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Research Interests

Spatio-temporal statistics • Bayesian hierarchical modeling • Approximate Bayesian computation • 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

Experience

- 2021 – present **Graduate Research Assistant**
Centre for Environmental Informatics, University of Wollongong Wollongong, NSW
Investigated extending the centre's Bayesian hierarchical 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; researched 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 motivated, 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 multi-objective optimization problems such as water resources planning and decision making.

Publications

5. Cressie, N., A. Zammit-Mangion, **J. Jacobson**, and M. Bertolacci (2023). Earth's CO₂ battle: a view from space. *Significance*, 20, 1, 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, 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*.
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, 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, 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

Research Grants

- 2023 NASA 23-OCOST23-0001, Student Investigator
“Hierarchical Spatio-Temporal Statistical Methods for Analyzing OCO-2/3 Data”

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
RMAACC 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

Teaching

- 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, & Writing

- 2024 – present Postgraduate Seminar Series Head, School of Mathematics and Applied Statistics, University of Wollongong
- 2022 “Global CO₂ Flux: Bayesian statistical inversion using the WOMBAT framework.”
Centre for Environmental Informatics, University of Wollongong
- 2019 Radio Show Host, “Probably Novel Podcast,” Department of Applied Mathematics, University of Colorado
- 2017 – present Open-Source Developer, Pull-requests accepted by ArviZ, Parasol, parcoords-es, and Mamba
- 2016 – 2018 Mentor, Engineering Honors Program, University of Colorado

Computer Skills

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