joshj@uow.edu.au
joshhjacobson.github.io
joshhjacobson
joshhjacobson

# Josh Jacobson

## Research Interests

Spatio-temporal statistics; Environmental statistics; Uncertainty quantification; High performance computing; Data science; Data visualization

## 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
Details on current projects

2021–present **Graduate Research Assistant**
Centre for Environmental Informatics, University of Wollongong — Wollongong, NSW
Web project and wombat work.

2019–2020 **Data Science Consultant**
Jupiter Intelligence — Boulder, CO
Improving the efficiency of Jupiter's hazards model by transitioning the calculations from Python to a distributed, parallel framework in the Julia language. This could save Jupiter thousands of dollars in compute time. Experiments regarding uncertainty quantification for parameters of the hazards model will also be carried out as time allows.

2019 **Data Science Intern**
Jupiter Intelligence — Boulder, CO
Developed a statistical model to generate physically realistic, regional sea level rise (SLR) projections for the next century at an annual resolution. Quantified the uncertainty introduced into Jupiter's hazards model by including the SLR generator 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 (e.g. water resources planning and decision making). The library packages a suite of visualization and machine learning techniques into a streamlined framework, allowing decision makers to quickly build shareable web applications for exploring tradeoffs in optimization results [1].

2017 **Data Engineering Intern**
VictorOps Boulder, CO
Analyzed the company's data pipeline for symmetry between large SQL databases of consumer logins. This work branched into the development of an R package to streamline database queries and other common data wrangling tasks within the company. The package was reviewed and pushed to production.

## 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

2022-04 *Approximate Bayesian computation for non-stationary processes*
Jupiter Intelligence, Boulder, 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

2019-08 *Uncertainty quantification for sea level rise*
Jupiter Intelligence, Boulder, CO, USA

2018-09 *Interactive visualizations for multi-objective optimization problems*
RMACC HPC Symposium, Boulder, CO, USA

### Seminars & Colloquia

2019-11 *Verification of spatial structure in ensembles of forecast fields*
Department of Mathematics, University of Zurich, Zurich, Switzerland

### Poster

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

Fall 2016 Teaching Assistant, CSCI 1320: Introduction to Programming for Engineers

## 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.

2017–2018 **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

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 Git, Julia, Linux, LaTeX, Matlab

Advanced 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*

### Climate Science

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

### Computer Science

Data Structures, Computer Systems, Algorithms, Introduction to Data Science