

DR. KYLE BARBARY

Senior Quantitative Researcher – The Climate Corporation

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I'm a quantitative researcher with extensive experience in scientific software engineering, large datasets, statistics and modeling. I'm passionate about (1) building better predictive models that have real effects on a product and (2) designing fast and usable tools to accelerate research, improve reproducibility and enhance understanding.

EDUCATION

University of California, Berkeley – Ph.D. in Physics

Thesis: *High-Redshift Type Ia supernova rates in galaxy cluster and field environments*

Advisor: Saul Perlmutter (2011 Nobel Laureate in Physics)

Harvey Mudd College – B.S. in Physics with Distinction

Thesis: *Measurement of the spatial coherence of second harmonic light produced at a gold surface*

SKILLS

Data: 12+ years experience dealing with large imaging datasets, image and signal processing, modeling, numerical optimization, MCMC methods, Bayesian statistics, hierarchical models.

Software: 12+ years experience: Python (numpy, scipy, matplotlib, pandas, cython), experience in C, Julia, SQL, UNIX. Release and maintenance of open-source libraries for astronomy, signal processing, and statistics in Python/C and Julia. Performance optimization of numerical software. 7+ years experience with testing, documentation tools, build systems, packaging, continuous integration, git, and collaborative development.

Communication: Extensive experience public speaking, writing journal articles, proposals, blog posts, communicating results.

Teaching: Experience planning and teaching workshops and tutorials, mentoring students.

Design: Experience with website and documentation design (HTML, CSS, markdown, ReST, LaTeX), presentations, logo design for several software projects.

SELECTED SOFTWARE

I wrote and maintain 4 packages on the Python package index and several more on the Julia Package index. See <http://kylebarbary.com/software> or <http://github.com/kbarbary> for more details. A few packages where I am the primary author:

SNCosmo Python library for supernova cosmology. (★34)

SEP Python and C library for Source Extraction and Photometry on astronomical images. (★70)

Nestle Nested sampling algorithms for Bayesian evidence in Python. (★51)

FITSIO.jl FITS file format I/O library for Julia. (★27)

Dierckx.jl 1-d and 2-d basis splines in Julia; Fortran wrapper. (★52)

EXPERIENCE

- 2018–2019 **Senior Quantitative Researcher, The Climate Corporation**
Evaluated skill in seasonal weather forecasts for informing seed selection models. Developed and improved predictive models for corn diseases, based on a combination of agronomic studies, disease data and machine learning approaches. Worked with teams across the company to understand and access datasets. Improved runtime of disease risk prediction code by a factor of 10, eliminating a research bottleneck. Developed detailed model of noise in field trial experiments, demonstrating the need for improved datasets.
- 2017 **Scientific Software Consultant**
Improved and extended the Celeste.jl codebase to run on multiple data sources. Celeste is the first program written in Julia to achieve over 1 petaflop performance.
- 2016–2017 **Project Scientist, UC Berkeley & Berkeley Institute for Data Science**
- 2014–2016 **Cosmology Data Science Postdoc, UC Berkeley & Berkeley Institute for Data Science**
As a member of the Nearby Supernova Factory project, rewrote a key piece of the data analysis pipeline. After rewrite, code returned more accurate answers, ran faster and more reliably, with a tenth the number of lines of code. Released [on GitHub](#). Designed new data management and processing pipeline for the project's 10s of TB astronomical dataset.
Released open-source Python libraries for supernova cosmology, analysis of astronomical images, and nested sampling (a MCMC-like statistical sampling technique).
Developed several core astronomy libraries for Julia and managed the “Julia Astro” organization.
Taught tutorials on Python packaging, licensing, testing, documentation, Julia, git and GitHub.
Organized several workshops for statistical and computing methods in astronomy.
- 2012–2014 **Director's Postdoctoral Fellow, Argonne National Laboratory**
Alongside research program, developed modern, extensible Python library for supernova cosmology, enabling studies of systematic uncertainty that were formerly burdensome or prohibitively difficult.
- 2011–2012 **Postdoctoral Fellow, Lawrence Berkeley National Lab**

SELECTED TALKS AND PUBLICATIONS

Author of over 30 peer-reviewed articles. Referee for several astronomical journals, Supercomputing conference.

Talk *Julia and Python in Astronomy: Better Together* – Python in Astronomy 2016 – Seattle, WA, March 2016

Talk *JuliaAstro* – JuliaCon 2015 – Boston, MA, July 2015

Publication *SEP: Source Extractor as a Library*. The Open Journal, 1, 6 (2016)

Publication *The HST Cluster Supernova Survey: The Volumetric Type Ia Supernova Rate*. ApJ, 745, 31 (2012)

Publication *The HST Cluster Supernova Survey: The Type Ia Supernova Rate in High Redshift Galaxy Clusters*. ApJ, 745, 32 (2012)

Publication *Discovery of an Unusual Optical Transient with the Hubble Space Telescope*. ApJ, 690, 1358 (2009)

FUN FACTS

I raced road bikes in college and grad school at a national level; now I ride for fun and I'm also getting into mountain biking. I'm an avid skier in the Winter and enjoy backpacking in the Summer.