

RESEARCH
SOFTWARE
ENGINEER

I specialize in multi-institution open-source software development, cloud and high-performance computing, and verification and validation of scientific models. I have extensive experience with end-to-end data science projects incorporating machine learning and statistical analysis of Big Data using the scientific python ecosystem.

TECHNICAL SKILLS

Languages: Python, R, C++, FORTRAN, SQL, Bash, \LaTeX
 Operating Systems: Unix/Linux (desktop and HPCs), Windows, OSX
 Math/Science Packages: Anaconda, Scikit-learn, Pandas, Xarray, Numpy, Scipy, MATLAB
 Climate/GIS Tools: QGIS, NetCDF, NCO, NCL, PyNIO/PyNGL, CF-conventions
 Web Development: Javascript, HTML, CSS, PHP, Drupal, Jekyll
 Data Science: PCA, multivariate testing, regression analysis
 Frameworks/Skills: Agile software development, test-driven development, verification and validation, unit and integration testing, continuous integration, version control systems

PROJECT
HIGHLIGHTS

Developed LIVVkit, an ice-sheet model verification and validation toolkit, to provide a wide range of validation analysis covering atmosphere-ice and land-ice interactions as well as ice sheet dynamics. These analysis incorporate everything from point measurements (e.g., weather stations and ablation stakes) to airborne radar altimetry (e.g., NASA IceBridge) and satellite observations (e.g., RADARSAT, NASA GRACE). These analyses exercise the entire data science pipeline, from data wrangling and cleaning to reporting.

Developed EVV, a python package to evaluate the climate statistics of an Earth system model test ensemble against that of a baseline ensemble, by using several modern non-parametric (distribution-free) two-sample statistical tests (e.g., K-S test) for multivariate data to determine the equality of distributions. The critical value for rejecting the null hypothesis is determined by using bootstrap resampling.

Developed a statistical model of ice-crystalline fabric evolution and (two-way) coupled it to a ice sheet flow model by using a Principle Component Analysis (PCA) of the fabric distribution to determine an ice-flow enhancement factor in situ.

PROFESSIONAL
EXPERIENCE

Alaska Satellite Facility, Fairbanks, Alaska, USA

Research Software Engineer

Geophysical Institute, University of Alaska Fairbanks

September 2019 – present

Develop and maintain ASF's open-source scientific tools and services, including [On Demand SAR processing](#) through [HyP3](#), [OpenSARlab](#), and [ASF's SAR toolboxes](#). Transform internally and externally developed science (algorithm and processing) prototypes into Cloud and HPC production services, and execute global-scale processing campaigns.

Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA

Computational Scientist in Glaciology

Climate Change Science Institute

December 2016 – September 2019

Perform research tasks using DOE's Earth system model E3SM and ice sheet models (e.g., MPAS-LI, BISICLES, PISM, CISM); coordinate the verification and validation of E3SM, MPAS-LI, and BISICLES simulations; development of the Land Ice Verification and Validation toolkit (LIVVkit), a python-based toolkit for robust evaluation of ice-sheet models; and develop an extended V&V evaluation tool (EVE) for climate reproducibility testing of ESMs.

Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA

Postdoctoral Research Associate

Climate Change Science Institute

January 2015 – November 2016

Perform research tasks using the Community Ice Sheet Model (CISM) and coordinate the development of the Land Ice Verification and Validation toolkit (LIVVkit) — a python-based toolkit for robust evaluation of ice-sheet models.

Advisor: Dr. Katherine J. Evans

SOFTWARE	<p>Developer of the Alaska Satellite Facility’s Hybrid Pluggable Processing Pipeline (HyP3; pronounced “hype”). HyP3 consists of:</p> <ul style="list-style-type: none"> ◇ <i>The platform</i>: An AWS-based job orchestration engine with a friendly, OpenAPI and Swagger based, API. ◇ <i>Science plugins</i>: Container-based science algorithms and processing software. When invoked, they marshal input data, generate an output product, and upload the product to the cloud. Plugins can be used independently of the platform. ◇ <i>Science products</i>: The data our users are after – typically GeoTIFF and netCDF based data, with associated metadata, documentation, and usage guides. ◇ <i>Tools</i>: ArcGIS plugins, python packages for working with the HyP3 API and HyP3 products, and other packages useful for HyP3 development. ◇ <i>Documentation</i>: How we help our users, and ourselves. This includes product/software/tool documentation, examples and guides, and everything that goes into making documentation usable and look great. <p>The entire HyP3 ecosystem is open-source and developed within the ASFHyP3 organization on GitHub.</p>
	<p>Contributor to open-source software projects</p> <ul style="list-style-type: none"> ◇ Conda-forge recipe maintainer for: <ul style="list-style-type: none"> ◇ ASF Tools ◇ HyP3 SDK ◇ MPAS-Analysis ◇ EVV ◇ ILAMB ◇ MPAS-Tools ◇ HyP3lib ◇ JSON tricks ◇ TempestRemap ◇ HyP3 Metadata ◇ LIVVkit ◇ PR48 to tox-conda leading to release of v0.4.0 with support for <code>conda-spec.txt</code> and <code>conda-env.yml</code> files. ◇ PR19 and PR27 to sphinx-js leading to release of (bugfix) v2.0.1 and contributing to v2.2. ◇ PR10 to ILAMB helping the python 2 to 3 conversion and allowing an editable install with pip.
PUBLICATION HIGHLIGHT	<p><i>Kennedy, J.H., A.R. Bennett, Evans, K.J., S. Price, M. Hoffman, W.H. Lipscomb, J. Fyke, L. Vargo, A. Boghazian, M. Norman, P.H. Worley. (2017). LIVVkit: An extensible, python-based, land ice verification and validation toolkit for ice sheet models. Journal of Advances in Modeling Earth Systems, 9(2), 854–869. DOI:10.1002/2017MS000916</i></p>
EDUCATION	<p>University of Alaska Fairbanks, Department of Physics, Fairbanks, Alaska, USA Ph.D., 2015, Physics. Advisor: Dr. Erin C. Pettit</p> <p>Western Washington University, Department of Physics, Bellingham, Washington, USA B.S., 2008, Physics. Minor: Astronomy</p>
AWARDS	<ul style="list-style-type: none"> ◇ 2016 ORNL CCSI Professional Development Award, \$100,000 ◇ 2013–2014 UAF Thesis Completion Fellowship, \$15,000 + tuition ◇ 2011–2012 NSF CASE GK-12 Fellow, \$45,000
SYNERGISTIC ACTIVITIES	<p>2021–present Serve on the NASES ESDS Cloud Analytics Reference Architecture Working Group.</p> <p>2018 Organized a minisymposium on computational methodologies for next-generation climate models at the European Seminar on Computing (ESCO) 2018 conference in Pilzen, Czech Republic.</p> <p>2017 Organized an international workshop on human activity at scale in Earth system models at Oak Ridge National Laboratory.</p> <p>2016–present Referee for the Australian Antarctic Division, the Geophysical Journal International, Journal of Geophysical Research, Journal of Mountain Science, and Polish Polar Research.</p>
OTHER SKILLS AND ACTIVITIES	<ul style="list-style-type: none"> ◇ Wilderness experience including a continuous 700 mile, 33 day, canoe trip down the Yukon River ◇ Extensive boat experience: sailing, canoeing, power-boating, etc. ◇ Enjoy outdoor recreation: biking, hiking, backpacking, camping, etc. ◇ Trained in bear safety