

# Kai Pak

<https://kaipak.github.io>

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## EDUCATION

### COLUMBIA UNIVERSITY

#### MS, APPLIED PHYSICS

Sep. 2016 - May 2018 | New York, NY

School of Engineering and Applied Sciences

Applied Mathematics and Applied Physics

Earth and Environmental Sciences

### PORTLAND STATE UNIVERSITY

#### BS, PHYSICS

Jun. 2009 - Jun. 2014 | Portland, OR

Honors College

Dean's List

Summa Cum Laude

## COURSEWORK

Numerical Methods

Numerical Methods of PDEs

Methods in Scientific Computing

Big Data Science Analytics Research

Computational Physics

Data Structures

Systems Programming

## SKILLS

### PROGRAMMING LANGUAGES

Python • Shell • Puppet • Ruby • Perl

TeX • C • C++ • SQL • HTML

### FRAMEWORKS AND APPS

Puppet Enterprise • Ansible

Git/GitHub • Jenkins

Kubernetes • Containers

### PLATFORMS AND OS

Linux: RHEL, Ubuntu, Debian

Amazon Web Services

Google Compute Platform

VMware vSphere, vRealize

macOS • Windows Server

### AREAS OF EXPERTISE

Scientific Computing

Datacenter Automation

DevOps

Cloud Computing

Server Virtualization

Linux System Administration

## EXPERIENCE

### COLUMBIA UNIVERSITY

JAN. 2018 – PRESENT | PALISADES, NY

#### DATA SCIENCE AND TECHNOLOGY INTERN

- Contributing member of Pangeo Data: an NSF funded project to design, develop, and implement open source and cloud-based Big Data analytics tools and platforms based on Python scientific computing packages for the geosciences.
- Designed and implemented test suite written in Python to collect metrics of storage IO performance on parallelized cloud and HPC environments. Automated tests and benchmarking suite identified bugs, bottlenecks, and overall performance characteristics utilizing a modified Airspeed Velocity (ASV) framework and Pandas reports.
- Identify performance characteristics of a variety of use cases such as Dask/Xarray, Numpy, and raw read/writes on storage backends from NetCDF on FUSE mounts, to novel implementations such as Zarr and TileDB on Google Cloud Store utilizing GCSFS.

### PUPPET LABS

APR. 2015 – JAN. 2017 | PORTLAND, OR

#### SYSTEM ENGINEER

- Worked intimately with Puppet sales team by delivering architecture and technology consulting services. Engaged with clients' engineering teams through collaborative sessions to fully break down and systematize their infrastructure challenges and use cases.
- Designed proof-of-concept systems to demonstrate how infrastructure as code, automation, and open source tools can increase reliability, reduce errors, and facilitate collaboration between operations and development teams.
- Led monthly live-streaming webinar/Podcasts where new feature sets of Puppet Enterprise was demonstrated, followed by technical discussions and Q&A.
- Built internal testing pipeline based on Jenkins, VMware vRealize Automation, custom Ruby, and Puppet Enterprise for the development and testing of demo modules for clients. Project allowed engineering team to test and merge new demos into a common environment in a matter of hours as opposed to days or weeks.

### CON-WAY

JAN. 2010 - MAR. 2015 | PORTLAND, OR

#### SENIOR LINUX SITE RELIABILITY ENGINEER & TECHNOLOGY CONSULTANT

- Designed and modernized internal VMware environment consisting of 120 nodes accessing over 10 THz of CPU and 30 TB of memory. Operations streamlining and automation scripts reduced provisioning times from 4-6 weeks to less than a week as well as increasing VM reliability (99.8% uptime) and performance consistency.
- Implemented library of Python code to automate staging, backup, replication, and off-site vaulting of primary datacenter consisting of 5000 physical and virtual nodes and several petabytes of data produced each month. Code automated backup infrastructure, completely removing sysadmin intervention and requiring minimal operator oversight. Awarded innovation award by CIO for efforts towards backup automation.

# RESEARCH

## COLUMBIA UNIVERSITY

JAN. 2017 - PRESENT | PALISADES, NY

LAMONT-DOHERTY EARTH OBSERVATORY

RESEARCH ASSOCIATE, OCEAN AND CLIMATE PHYSICS | ADVISOR: RYAN ABERNATHEY

- Analyze dataset from NASA/JPL mesoscale and submesoscale resolving general circulation model (MITgcm/LLC4320) to characterize dominant length scales of vertical tracer flux throughout the global oceans.
- Develop multiple methods to analyze length scales including implementing Numpy FFT-based spectral analysis, and creating custom Python package (xrsigproc) to apply 2-D convolution kernels to separate large and small scale variations per M. Germano (1991).

## OREGON STATE UNIVERSITY

JUN. 2017 - SEP. 2017 | CORVALLIS, OR

COLLEGE OF ENVIRONMENTAL, OCEAN, AND ATMOSPHERIC SCIENCES

NSF FUNDED RESEARCH ASSOCIATE | ADVISOR: ANDREAS SCHMITTNER

- Modify coarse resolution model (UVic2.9 written in Fortran) to improve mesoscale eddy parameterization agreement with observation and resolving models. Modifications include capturing effects of thickness and isopycnal diffusivities.
- Instituted modern software development workflows (e.g., moving codebase to GitHub) to more easily track code changes and bugs and efficiently promote experimental branches into work streams

## PORTLAND STATE UNIVERSITY, DEPARTMENT OF PHYSICS RESEARCH ASSOCIATE | ADVISOR: JACK STRATON

Jun. 2014 - Jan. 2016 | Portland, OR

- Implement Python (Numpy, Scipy) code to model interparticle physics of hydrogen and anti-hydrogen ions in Hylleraas coordinates for utilization in anti-hydrogen experiments with ALPHA group at CERN.

# PUBLICATIONS AND PRESENTATIONS

- Optimizing Storage performance for Big Data analytics and  $n$ -dimensional arrays on clustered cloud and HPC platforms. Paper in progress, expected Summer 2018.
- Characterizing length scales of vertical tracer fluxes in submesoscale resolving global ocean models. Paper in progress, expected Winter 2018.
- Producing the Positive Antihydrogen Ion  $H\bar{p}^+$  via Radiative Attachment, Chris M. Keating, Kai Y. Pak, and Jack C. Straton. Journal of Physics B: Atomic, Molecular and Optical Physics. March 16, 2016.
- Production of Antihydrogen Ions via Radiative Attachment, Chris Keating and Kai Pak. Poster presentation at Portland State University Research Symposium. Portland, Oregon. Apr 2015.
- Symmetry Investigation in Antimatter, Kai Pak. Poster presentation at Sigma Xi Symposium, Willamette Chapter. Portland State University. Portland, Oregon. Apr 2015.

# HONORS AND RECOGNITIONS

- 2018 NSF Graduate Research Fellowship Program (GRFP) Honorable Mention
- Portland State University Honors College
- Sigma Pi Sigma Physics Honors Society
- Phi Kappa Phi Honor Society

# PROFESSIONAL ASSOCIATIONS

- Society for Industrial and Applied Mathematics
- American Geophysical Union
- American Meteorological Society