**High-Performance Computing (Resources and Capabilities)**

<https://github.com/wsphd/csun-hpc/>

**"High-Performance Computing (Resources and Capabilities)**  
**California State University, Northirdge (CSUN)**

**Friday, April 11, 2025**  
**CSUN Faculty Retreat - Odyssey Restaurant**

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Introduction/Background/Motivation

**Introduction/Background/Motivation**

* Some n i N needs are ≤ contemporary desktop/laptop and software
  + But double-check new methodologies and growth (and by extension, movement) of data
* Some n j N needs are > contemporary desktop/laptop and software
  + Essentially, "compute-intensive, data-intensive, or network-intensive"
  + Use primarily FOSS (Linux, Open Source, etc.) to complement COTS (Windows, SPSS, etc.)
* Private, "on-premises" servers
  + Usually purchased by an individual faculty member or Dept. (often with a grant or project)
  + Usually located in the on-campus CSUN MDF
  + CSUN IT usually racks and networks the system; Users manage the system and applications
* Public Cloud (AWS, GCP, MS-Azure, OCI, Digital Ocean, etc.)
  + Use "free-tier" (still need to provide a credit card)
  + Purchase credits with a credit card
  + Scholars can ask for resources for substantive reseearch
* Or?
  + NSF-funded, multi-year, inter-institution, STEAM/SocialSTEM, R3s/CCC's too
  + [CSUN IT Technology Resources for Research](https://www.csun.edu/it/technology-resources-research)

General Advanced Computing/Data Management

**General Advanced Computing/Data Management**

* There are plenty of (non-HPC) advanced computing issues too (research and instruction).
* Ecosystem Transition: Compute
  + COTS languages (e.g., SPSS, Stata, MPlus, Matlab) -> FOSS languages (e.g., R, Python, Julia)
  + COTS spreadsheets (e.g., Excel ) -> FOSS spreadsheets(e.g., LibreOffice).
  + Operating Systems (e.g., Windows/MacOs ) *plus* Linux, Excel -> LibreOffice, etc.
  + Beyond replication -> Reproducibility (not just 'A' journals)
* Ecosystem Transition: Data
  + "Big Data"
  + research results can include output data (and perhaps even source data) too
* Ecosystem Transition: Network
  + "Big Data"
  + research results can include output data (and perhaps even source data) too
* Example: Technology Trends
  + Campus Labs *plus* Home Labs, Open Science, Open Research, Open Data, Open anything...
* I'm happy to discuss these issues too but it's not the focus on this material.

Jetstream2

**Jetstream2**

* Managed by Indiana University
* 100's of GiB of RAM, 10's of PB of disk, 10's of [GPUs](https://en.wikipedia.org/wiki/Graphics_processing_unit), fast networks
  + Best for new learners, data science projects (R, Python, Julia, etc.), large simulations, gateway to other systems, including several supercomputers around the country
* Need an "ACCESS ID"
  + Like an ORCID ID but for Research Computing
  + Have CV or Resume for upload (don't worry, your request will be approved)
* Be willing to learn:
  + How to ask (nicely and well, for more (incrementally) resources, and read a simple dashboard
  + the Command line and Linux
  + Webshell
  + SSH for logging int (and some learning curve for generating SSH keys and passphrases)
  + SCP for file transfer (after the SSH process is done)
* (Live demo)
* Start here:
  + [Jetstream ACCESS page]<https://jetstream-cloud.org/get-started/index.html>

Nautilus/NRP

**Nautilus/NRP**

* Managed by University of California, San Diego
* 100's of GiB of RAM, 10's of PB of disk, 100's of [GPUs](https://en.wikipedia.org/wiki/Graphics_processing_unit)/[FPGAs](https://en.wikipedia.org/wiki/Field-programmable_gate_array)/[TPUs](https://en.wikipedia.org/wiki/Tensor_Processing_Unit)/[DPUs](https://en.wikipedia.org/wiki/Data_processing_unit), very fast networks
  + Best for leading-edge science and engineering, especially w/ funded labs and staff
* Be willing to learn:
  + Must be comfortable with the Command Line, Open Source, and Linux
  + Kubernetes (open source client-server), you use the "kubectl" binary
  + You control just about everyting with ASCII ".yaml" files
* (Static demo)
* Start here:
  + Send Wayne an email - [ws@csun.edu](mailto:ws@csun.edu)

Additional Resources (at no charge)

**Additional Resources**

* Sometimes, researchers just need an unmanaged or managed (by students, supervised by faculty) resource to host public-facing files and applications
  + [Oregon State University Open Source Lab (OSL)](https://osuosl.org/)
* Recently, CSUN was added to the Cloudbank/2i2C JupyterHub resource (this complements CSUN Apporto and SDSU/CSUSB TIDE)
  + [Cal-ICOR JupyterHub Pilot](https://csun.cloudbank.2i2c.cloud/)
* Increasingly, Libretexts is moving beyond "texts" and becoming a complete LMS solution, including a JupyterHub resource
  + General System - [LibreTexts](https://libretexts.org/)
  + Specific Application - [JupyterHub](https://jupyter.libretexts.org/hub/login)
* Some researchers want to experiment with real Quantum resources
  + [D-Wave LEAP Quantum Launchpad/D-Wave Learn Program (D-Wave)](https://www.dwavequantum.com/learn/training/)
* Many researchers require an AI system that *is* open, transparent, and reproducible (built *top-down*)
  + [NSF National Artificial Intelligence Research Resource Pilot (NAIIR)](https://nairrpilot.org/)
* Some researchers desire an AI system that *is* open, transparent, and reproducible (built *bottom-up*)
  + [Non-Profit Personal AI Lab (Kwaai)](https://www.kwaai.ai/)

Conferences/Fellowships

**Conferences/Fellowships**

* There are plenty of zero-cost and low-cost U.S. domestic events for learning about HPC resources at the *Application*-level.

| **Name** | **Venue** | **Cost** | **Timeframe** |
| --- | --- | --- | --- |
| [Practice & Experience in Advanced Research Computing (PEARC)](https://pearc.acm.org/) | varies | mid $ | late July |
| [Science Gateways (SGX3)](https://sciencegateways.org/gateways2025) | varies | $0 (NSF) | varies |
| [Confab (DOE)](https://confab25.es.net/) | varies | low $ | early April |
| [Institute for Mathematical and Statistical Innovation (IMSI)](https://www.imsi.institute/) | varies | $0 (NSF) | varies |

* There are plenty of zero-cost and low-cost U.S. domestic events for learning about HPC resources at the *Infrastructure*-level.

| **Name** | **Venue** | **Cost** | **Timeframe** |
| --- | --- | --- | --- |
| [Research Computing at Smaller Institutions (RCSI)](https://rcsi.swarthmore.edu/) | Swarthmore, PA | $0 (NSF) | early June |
| [National Research Platform (NRP)](https://portal.nrp.ai/6nrp-workshop/) | UCSD, CA | $600 | late January |
| [Supercomputing (SC)](https://sc25.supercomputing.org/) | St. Louis, Denver, Atlanta | low $ | mid November |
| [Corporation for Networking and Research (CENIC)](https://cenic.org/events) | varies | low $ | late March |
| [Southern California Linux Expo (SCaLE)](https://www.socallinuxexpo.org/scale/22x) | Pasadena, CA | low $ | early March |

* And the list of *International* events for learning about HPR resources is growing quickly.

| **Name** | **Venue** | **Cost** | **Timeframe** |
| --- | --- | --- | --- |
| [CINI HPC Summer School (CINI)](https://www.hpcsummerschool.it/) | Naples, Italy | N/A | mid June |

* The following are some of the Fellowships available:
  + [ICICLE: Intelligent CI with Computational Learning in the Environment (ICICLE)](https://icicle.osu.edu/education-and-outreach/icicle-educational-fellows-program)

National Workshops

**Natonal Workshops**

* There are plenty of *in-person* events for learning about HPR resources.

| **Name** | **Venue** | **Cost** | **Timeframe** |
| --- | --- | --- | --- |
| [Open Science Grig (OSG)](https://osg-htc.org/school-2025/) | U of Wisconsin-Madion, WI | $0 (NSF) | late June |
| [HPC and Data Science Summer Institute (SDSC)](https://na.eventscloud.com/website/83760/) | UCSD, CA | $350 | late July - early August |
| [NERSC International HPC Summer School (NERSC)](https://www.nersc.gov/users/training/events/2025/international-hpc-summer-school-july-2025/) | varies | $0 (DOE) | early July |
| [KNIT (FABRIC)](https://knit.fabric-testbed.net/) | varies | $0 (NSF) | mid March |

* There are plenty of *virtual* events for learning about HPR resources.

| **Name** | **Venue** | **Cost** | **Timeframe** |
| --- | --- | --- | --- |
| [OU Supercomputing Center for Education & Research (OU)](https://www.oscer.ou.edu/virtualresidency2024.php) | virtual, synchronous | $0 (NSF) | late June |
| [HPC Pathways (NCSA)](https://www.hpc-training.org/moodle/enrol/index.php?id=101) | virtual, asynchronous | $0 | on-going |
| [Cornell Roadmaps](https://cvw.cac.cornell.edu/roadmaps) | virtual | $0 | asynchronous, on-going |
| [HPC Carpentry](https://www.hpc-carpentry.org/) | in-person and virtual, synchronous | $0 | varies |
| [(comprehensive, searchable list of resources](https://campuschampions.cyberinfrastructure.org/knowledge-base/resources) | N/A | $0 | varies |

Upskilling - Professional Associations/Societies

**Upskilling - Professional Associations/Societies**

* Faculty - These HPC resources should be of use to *Faculty* over time.
  + [R OpenSci (ROpenSci)](https://ropensci.org/)
  + [PyOpenSci (pyOpenSci)](https://www.pyopensci.org/)
  + [JuliaCon (annual Summer conference abstracts, proceedings)](https://juliacon.org/2025/)
  + [Framework for Open and Reproducible Research Training (FORRT)](https://forrt.org/)
  + [Open Accelerated Computing (OpenACC) (C/C++ optimizations for research, annual Summer conference)](https://www.openacc.org/)
  + (and check your discipline's pre-conference workshops and related conference themes for HPC events)
* Staff - These HPC resources should be of use to *Staff* over time.
  + [US Research Software Engineering Association (US-RSE)](https://us-rse.org/)
  + [Campus Research Computing Consortium (CaRCC)](https://carcc.org/)
  + [Campus Champions](https://campuschampions.cyberinfrastructure.org/)
  + [OpenOnDemand](https://openondemand.org/)
  + [Internet2 Research Engagement](https://internet2.edu/community/research-engagement/research-community/)
  + [EduCause Research Computing and Data Community Group](https://www.educause.edu/community/research-computing-and-data-community-group)
* Administration - These HPC resources should be of use to *Administration* over time.
  + [Coalition for Academic Scientific Computing (CASC)](https://casc.org/)
* Sundry - These HPC resources should be of use to various individuals over time.
  + [ES NET (DOE)](https://www.es.net/)
  + [The Quilt](https://www.thequilt.net/)
  + [Fabric](https://portal.fabric-testbed.net/about/about-fabric)
* Sundry - These open source resources should be of use to various individuals over time.
  + [UC Open Source Program Offices)](https://www.socallinuxexpo.org/scale/22x/presentations/building-network-open-source-program-offices-university-california)
  + [Professional Development for Instructors Interested in Student Participation in Humanitarian Free and Open Source Software (POSSE)](https://teachingopensource.org/POSSE)