Requesting Resources via the National Al Research Resource (NAIRR) Pilot

Intro to National Artificial Intelligence Research Resource (NAIRR) Pilot – 2025-09-29 Lauren Michael, Internet2 Timothy Middelkoop, Internet2

This Work

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Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.







What We'll Cover Today

- Allocable NAIRR Pilot Resources for AI Research and Education
- Resource Allocation Opportunities, Eligibility, Expectations, and Example Projects
- Allocation Process
- Proposal Instructions and Review Criteria
- What Makes a Good Proposal
 - Common Reasons for Rejection Resource Estimate Examples
- How to Get More Help

NAIRR Pilot Program

- Connects U.S. researchers and educators to computing capacity, tools, data, and training resources for AI research https://nairrpilot.org/about
- Multi-agency, public-private *pilot* coordinated by the NSF https://new.nsf.gov/focus-areas/artificial-intelligence/nairr
 - Task Force initiated in 2020, Pilot Launched in 2024, Continues with recent Al Action Plan
- Equitable access regardless of academic or non-profit organization size or type, funding sources, or academic domain of application.

NAIRR Pilot **Example Use Cases**

- Hands-on AI course requiring GPU resources for undergraduate or graduate students to develop and train models.
- Training AI models on large medical imaging datasets for disease detection.
- Evaluating and improving the use of LLMs for code synthesis.
- Building and using custom LLMs for medical diagnoses.
- Benchmarking existing models for capabilities, security, and trust.
- Scaling up AI model training, including using simulation and synthetic data
- Use of novel AI hardware for training and inference.

NAIRR Pilot National Artificial Intelligence Research Resource Pilot

NAIRR Pilot - Private Sector Resources

These resources represent leading-edge offerings from corporate and non-profit organizations. So new we're still trying to decide how to classify them.

Cloud Providers

IBM & Partners
Microsoft Azure
Voltage Park

On Pause

NVIDIA DGX Cloud

Amazon Web Services

Google Cloud Platform

Training Hardware

Cerebras CS-2

Inference/Model Services

Anthropic
Groq LPU Inference Engine
OpenAl
SambaNova Cloud

Tools and Software

DataBricks

Eleuther Al

Hugging Face

Lexset.ai NEW!

OpenMined

Weights & Biases

nairrpilot.org > Current Opportunities

NAIRR Pilot National Artificial Intelligence Research Resource Pilot

NAIRR Pilot - GPU and CPU Resources (federally supported)

These resources comprise mostly homogeneous partitions or are dominated by a single processor type. The number and types of hardware vary from resource to resource.

NVIDIA V100

PSC Bridges-2 GPU 264 V100s

SDSC Expanse GPU 208 V100s

NVIDIA RTX-5000

TACC Frontera GPU 360 RTX-5000s

NVIDIA A100 / A40

NCSA Delta GPU 400 A100s & 400 A40s

Purdue Anvil GPU 64 A100s

TACC Lonestar-6 GPU 48 A100s

NVIDIA H100 / Grace Hopper

NCSA DeltaAl 456 H100s

PSC Bridges-2 GPU 80 H100s

Purdue Anvil Al

SDSC Expanse Al

136 H100s

TACC Vista

608 GH H100s

AMD Milan

Purdue Anvil CPU TACC Lonestar-6

AMD Rome

PSC Bridges-2 CPU SDSC Expanse CPU

Intel Cascade Lake

TACC Frontera

Large-Memory Nodes

PSC Bridges-2 EM

(Extreme Memory)

nairrpilot.org > Current Opportunities

NAIRR Pilot - AI and Other Resources (federally supported)

The NAIRR Pilot includes resources that offer alternative architectures designed to support a wide range of needs beyond the more conventional HPC architectures.

Al Accelerators

PSC Neocortex

Two Cerebras CS-2 systems

SDSC Voyager

42 8x Intel Habana Gaudi training nodes

DOE ANL AI Testbed

four different architectures

- Cerebras CS-2
- SambaNova DataScale SN30
- Graphcore Bow Pod 64
- Groq LPU Inference Engine

Cloud

Indiana Jetstream-2 GPU

360 A100 GPUs



Heterogeneous hardware

Composable & Distributed

Texas A&M U ACES

composable system with a wide range of processor and accelerator options

FABRIC

distributed compute / network platform



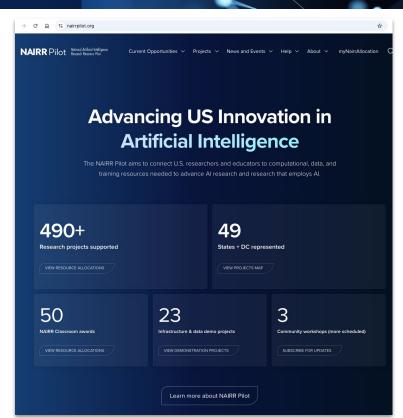
Al @ Edge infrastructure

nairrpilot.org > Current Opportunities

NAIRR Pilot National Artificial Intelligence Research Resource Pilot

Allocations in the NAIRR Pilot

- Visit https://nairrpilot.org/
- Under "Current Opportunities," select
 - Researcher Resources, for research projects
 - Classroom/Educators Resources, for teaching activities
- Full-Scale Requests require a 3-page proposal
 - See website and webinars for instructions
 - NAIRR Pilot Expansion awards have an accelerated review process
- New! NAIRR Pilot Start-Up requests
 - Short project description and capped resource allocation amounts, awarded within 2 weeks
- Even Newer! NAIRR Pilot Deep Partnerships
 - Close collaboration with some private sector providers; unique offerings, dates, and review



nairrpilot.org > Current Opportunities

Slide courtesy of Dave Hart, NAIRR Pilot Allocations

NAIRR Pilot Deep Partnerships - NEW!!

- Several industry partners are interested in engaging interactively and collaboratively on selected research projects...
- Potential project areas, partnership expectations, durations, submission deadlines, and review timelines vary for each Partnership Opportunity.
- Proposer eligibility, overall project expectations, and proposal instructions are similar to the Research Resources opportunity.
- See the Deep Partnerships web page for available partnerships and complete expectations, eligibility and other requirements: https://nairrpilot.org/opportunities/deep-partnerships

NAIRR Pilot Allocation **General Requirements**

- Research or course must have an AI component.
- Principal Investigator / Lead Instructor and all other users must perform work via an eligible organization physically based in the U.S.
 - Other types of organizations, such as commercial entities, may be eligible (see portal)
 - **U.S. citizenship is not required**, unless noted in resource-specific requirements
- Principal Investigators (PIs) and Lead Instructors will be listed on the NAIRR
 Pilot website with their affiliation, the project or course title, abstract, and
 allocated resources.
- Only use institutional email addresses (no @gmail)

NAIRR Pilot Research Resources Opportunity

NAIRR Pilot **Allocation Process**

- 1. Proposals accepted at any time (<3 pages)
- 2. Proposals peer-reviewed approximately monthly (15th of the month)
 - 2+ reviewers per proposal, per request size/complexity
- 3. Selected proposals matched to resources.
 - Matching committee includes reps from every resource-provider.
 - Proposers requesting only gov-funded resources can ask to be invisible to non-gov partners.
 - Matching may adjust the requested quantity or resource(s), per reviewer suggestions and/or resource availability.
- **4. Selected awards notified.** (within 3 months)
- Resource onboarding between NAIRR Pilot Resource and Proposer. (1-3 weeks)
- 6. Pls provide required reports on progress.

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Available Resources

The set of resources available through the NAIRR Pilot has been expanded to include additional resources funded by federal agencies as well as resources contributed by private and non-profit sector partners. Over time, we expect new resources will be added to the NAIRR Pilot, and some resources may be removed from the pilot as their available contributions are committed to projects.

Researchers are strongly encouraged to review the most up-to-date list of resources, which will always be available via the <u>NAIRR Pilot</u> <u>Resource Catalog</u>.

Filters	Resources		
Al Capabilities Model inference services	Amazon Web Services		~
Model training services (GPU)Model training services (non-GPU)	Anthropic Model API		~
Research Collaboration Al tools and support Resource Category	Cerebras Wafer-Scale Engine 2 (CS-2) Al Accelerator		~
Resource Category Federal agency systems Private sector computational resource Private sector model access	Chameleon		^
	Resource Type:	Cloud Platform	
	Organization:	University of Chicago	
Other private sector contributionClassroom Platform	Units:	SUs	
Resource Type	User Guide:	Link to User Guide	
☐ Cloud ☐ GPU Compute	Features Available:	• Cloud	

NAIRR Pilot Focus Areas (Research)

Focus areas (updated!):

- Advancing AI methods that enable scientific discovery and improve AI interpretability, security and trust.
- Accelerating time to science and innovation through AI enabled automation, autonomy and novel design and control processes.
- Applying AI to use, share, or integrate sensitive data from multiple sources to enable new experimental methods and discovery.
- Advancing approaches for integrating simulations and AI.
- Creating or developing open-source AI tools, models, datasets, and methods.
- Training and educating the next generation AI-savvy workforce.

Other projects that align with the broader objectives of the NAIRR Pilot, as well as projects in other areas of AI research and applications, may secondarily be considered for allocation. See website: https://nairrpilot.org/opportunities/allocations

NAIRR Pilot Allocation **Eligibility and Requirements**

Research Resource Projects

- Project results must be open and are actively shared with the community.
- Use of resources (NAIRR project) must be completed within 12 months, can be shorter duration (other opportunities may be shorter).
 - Proposers may have multiple submitted proposals and/or active projects.
- All project PIs will be added to a NAIRR Pilot mailing list to foster a community of NAIRR Pilot researchers.
- Projects are required to complete brief progress reports and a final report.
 https://nairrpilot.org/reporting-guidance





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Resource Awards

Filters

Field of Science

- (Toggle All)
- Agriculture, Forestry, and Fisheries
- Applied Computer Science
- Artificial Intelligence and Intelligent Systems
- Astronomy and Planetary Sciences

Organization

Project Type

NAIRR Classroom

Resource

-- All --

(NAIRR240249) Building Al-enabled data visualization interfaces

Boettiger, Carl (University of California Berkeley)

Field of Science	Project Type	Dates
Ecology	NAIRR Classroom	2024-08-15 to 2025-08-14
Resources		~
Abstract		~

(NAIRR240301) Course on Deep Learning and Modern Applications

Tulabandhula, Theja (University of Illinois at Chicago)

Field of Science	Project Type	Dates
Computer Science	NAIRR Classroom	2024-10-21 to 2025-10-20
Resources		~

NAIRR Pilot **Proposal Instructions**

Follow the Instructions! https://nairrpilot.org/nairr-pilot-proposal-instructions
Your proposal is a research proposal. Submit when you are research proposal. Submit when you are research proposal. Submit when you are research proposal.

- Review Eligibility Requirements!
- Prepare Documents that meet review criteria
 - Project Description Outline (3 pages max, next slides)
 - Supporting Documents (CV; references)
- Submit via the NAIRR Pilot website: https://nairrpilot.org/opportunities/allocations
 - US-based institutional email address, only (no @gmail, etc.)
 - Include any **related** grant funding information in the application
- Supplements to an existing allocation are available through a similar process.

NAIRR Pilot **Project Description** Outline

To ensure your request can be properly reviewed and projects are directed to the appropriate resource(s), your description should include the sections outlined here.¹

A. Scientific/Technical Goal

scientific and methodological basis, focus area alignment, overall plan

B. Estimate of Compute, Storage and Other Resources

o computational approach, specific need for NAIRR Pilot resources, and detailed quantification

C. Support Needs

 \circ software/environment requirements and setup experience, restrictions on code, data, etc.,

D. Team and Team Preparedness

o roles and experience relevant to the approach and requested resources

NAIRR Pilot Review Criteria: Research

- **Alignment** with the NAIRR Pilot focus areas¹
- Project readiness and potential for near-term progress¹
- **Feasibility** of the technical approach¹
- Need for the computing, support, or other resources available via the NAIRR Pilot¹
- Knowledge and experience of the proposing team related to the proposed work¹
- ullet Estimated resource requirements and justification 1

Proposal Components: Scientific/Technical Goal

(roughly 1+ page)

- scientific and methodological basis, and goals
 - with citations of any relevant prior work and/or peer review
 - o including any funding for the proposed effort (grant, institutional, etc.)
- alignment with NAIRR Pilot Focus Areas
- overall plan and timetable for achieving goals
- public dissemination plan (see requirements)

Proposal Components: **Estimate of Compute, Storage and Other Resources**

(roughly 1 page)

- computational approach in relation to the research objectives
 - execution approach across project phases, experiments, and/or tasks
 - required models, user environment, software, datasets, parallelism /
 distribution approach, and the plan for accessing and/or implementing these
- detailed resource calculation, in resource-relevant units
 - (e.g. GPU or node hours, terabytes of storage, tokens, credits, and/or U.S. dollars)
 - how you determined values from prior work by the team or by others (see also: Start-Up requests)
 - total concurrent data storage needs in terms of inputs and outputs, including intermediate data, logs, etc.

¹<u>https://nairrpilot.org/opportunities/allocations</u> ²<u>https://nairrpilot.org/nairr-pilot-proposal-instructions</u>

Proposal Components: Support Needs

- requested support in relation to the computational approach
 - whether Resource Provider support staff will be essential, helpful or unnecessary, and for what needs
 - relevant access restrictions for the project, such as export-controlled code,
 ITAR restrictions, proprietary datasets or outputs, or personal health
 information (PHI) or HIPAA considerations
- if requesting research collaboration as offered by some resource providers, describe how your project is suited to and would benefit from the collaboration

Proposal Components: Team and Team Preparedness

- timeline and readiness for beginning the proposed use of resources
- list of ALL team members (including students)
 - o names, titles, affiliations, and project roles informing resource access
 - citizenship required for some access-restricted federal facilities
- team and/or individual expertise and experience
 - relevant to the proposed methodologies, computational tasks, and resources
 - the above do not require a lengthy list of accolades and achievements

NAIRR Pilot *Common Proposal Pitfalls*

- Failure to follow the Proposal Guidance on formatting, outline, etc.
- Including references in the main proposal instead of the supplemental doc.
- Failure to demonstrate the scientific merit and/or prior review for the proposed methodology or course.
- Failure to <u>connect resource requests to the described computational</u> <u>approach</u> (show your math!).
- Failure to demonstrate feasibility and readiness for the proposed scale (does the research team have demonstrated experience at similar scales).
- Failure to write a resource allocation request by using grant proposal language (this is a resource request with a different audience).

Examples

NAIRR Pilot Research Quantification Example 1

Computing Resources Given the complexity of our experiments, we request access to 18,000 Node Hours on TACC Lonestar6-GPUs (4xA100 per node). We arrived at these estimates based on benchmarks from recent similar sets of experiments that required approximately 1,000 GPU hours and around 2-3 weeks of wall clock time. For training policies in real-world hardware, similar efforts utilized 500-800 GPU hours with additional resources allocated for real-time testing and validation. Similarly, our ongoing projects based on method B require approximately 2,000 GPU hours and around 2-3 weeks of wall clock time. For training, similar efforts utilized 1,500-1,800 GPU hours with additional resources allocated for real-time testing and validation.

Data Storage All data required for training and evaluation will come from publicly available datasets such as XXXXXX (primary 10TB), XXXXXXXXX v2 (20GB), XXXXXXXX data (5GB), XXXXXXXX (10GB), and other custom datasets (30GB) generated by us as well. We estimate our storage needs to be <u>approximately 40 TB</u>.

NAIRR Pilot Research Quantification Example 1

- Needs to describe how recent prior experiments are similar with regards to the model, datasets, parameters, etc.
- Quantities are not connected to the final resource requests via math OR
 the attempts at math do not add up. If the reviewer is effectively grading a
 math problem, all the steps must make sense, with stated assumptions.
- Make method calculations explicit, for example, how long does a step in the calculation take and how many steps are involved? (also demonstrates that the method is being reasonably applied)

NAIRR Pilot *Research Quantification Example 2* - Excellent

Task	Training Iterations (est.)	GPU / HPU resources
1. Foundation model	40	10k GPU-hrs, 5k HPU-hrs
2. Generalizability	40	10k GPU-hrs, 5k HPU-hrs
3. Efficient transformers	100	25k GPU-hrs, 12.5k HPU-hrs
4. Scalability tests	20	5k GPU-hrs, 2.5k HPU-hrs
Total	200	50k GPU-hrs, 25k HPU-hrs

To meet our scientific goals, we request both <u>HPU resources on SDSC Voyager</u> and <u>GPU resources on Purdue</u> <u>Anvil</u>, splitting the work in parallel across these for overall project efficiency. For testing models with flash attention, <u>we require more recent GPUs that support it</u>, like <u>A100s or H100s</u>. For the first two tasks, we estimate needing about 40 training iterations, to test different model and dataset configurations. For the third task, we expect to run more rigorous hyperparameter optimizations, requiring more training iterations. For the scalability tests, we need fewer training iterations to evaluate the computational performance. In our most recent work [cited], we found that <u>training the XXXXX model once on the same XXXX dataset required roughly 500 GPU-hours when using an Nvidia A100 GPU. As shown in the scaling data <u>in Figure 2, the training time scales linearly across GPUs on the same node</u>, with roughly <u>2X speedup on H100s</u>.</u>

NAIRR Pilot *Research Quantification Example 3* - Excellent

We do not require additional datasets (we are the creator and manager of [community portal] datasets), computing resources, or data storage.

Software packages: To scale up the developed LLM applications, the project needs <u>software tokens</u> <u>from OpenAI GPT-4o</u>. Currently, the [community portal] receives queries from around one million unique users monthly, each completing multiple queries. Based on a test of the developed LLM applications and this usage history, we estimate that we will need <u>50 million input tokens and 75 million output tokens per month</u> to fully meet the needs in the [community portal] public data service.

With current OpenAI GPT-4o model <u>cost of \$5.00 per million input tokens and \$15.00 per million output tokens</u>, the monthly cost is \$1,335 and informing <u>our 12-month request of \$16,000</u>.

NAIRR Pilot Classroom/Educator Resources Opportunity

Eligibility

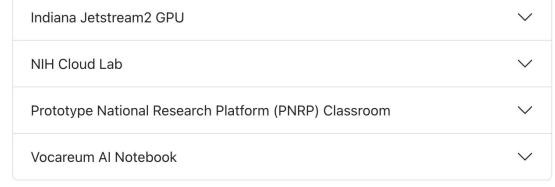
This call is open to proposals by US based educators and researchers who are teaching undergraduate or graduate courses or shorter duration training sessions to US based students that include subject matter in artificial intelligence and require that students use advanced computational resources as part of their coursework. Courses from any discipline are eligible for this program. Courses and training sessions must not allow participants who are not US based.

Available Resources

Filters Al Capabilities Model inference services Model training services (GPU) Al tools and support Resource Category Federal agency systems Other private sector contribution

Classroom Platform

Resources



NAIRR Pilot Classroom/Educator Resources Opportunity

Allocation Eligibility and Requirements – https://nairrpilot.org/opportunities/education-call

- Open to AI-relevant, US-based undergraduate and graduate courses, and short-form training.
 - All involved educators and learners must be physically based in the U.S.
- All primary educators and teaching assistants will be added to a NAIRR Pilot chat channel to foster community.
- Proposers must submit using their institutional (e.g. .edu) email address.

Proposal Instructions – https://nairrpilot.org/opportunities/education-call

- Proposal and allocation process / timeline similar to the Research opportunity.
- Online submissions form and 3-page Project Description with required outline.
- Supporting Documents (CV; team members/collaborators including TAs; references)

NAIRR Pilot Review Criteria: Classroom/Educator

- Alignment with the educational and workforce development focus.
- Readiness of the planned course, including institutional support
 commensurate with what is proposed. The resources offered <u>assume that</u>
 an instructor, teaching assistant, or other person will be the primary source
 of technical support for students accessing and using the resources.
- Match of request to the resources offered.

Resource requests should be based upon tests of same/similar resources by the instruction team. Check *Resource Descriptions* for details on resource units and calculation (e.g. units of computing resource, number of students, etc.).

NAIRR Pilot **Project Description** Outline

To ensure your request can be properly reviewed and projects are directed to the appropriate resource(s), your description should include the sections outlined here.

A. Course Description

o course objectives, target learners, format, timing, resource utilization plan

B. Estimate of Compute, Storage and Other Resources

computational approach, per-student and course-wide resource quantification

C. Support Needs

software/environment requirements and setup experience, restrictions on code, data, etc.

D. Team and Team Preparedness

roles and experience relevant to the course content and requested resources; citizenship

NAIRR Pilot Classroom/Education Example

• The class CS4281 "[title]" requires access to 150 Jupyter Notebooks for approximately 6 hours a week for 18 weeks per student for a total of 16,200 hours. For regular course material, only CPU notebooks are required on a system with 8GB of RAM, 4 cores, and with 10GB of storage per student. Additionally, students will have a final project that will require 10 hours a week for 2 weeks utilizing a large GPU (50% of a A100 or greater) for a total of 3,000 GPU hours. No additional storage is required. Support will be required to add GPU resources to notebooks.

Students	Weeks	Hours/Week	Resource	Total Hours	SU Size/Units	SU's
150	18	6	Vocareum Al Notebook	16,200	Students	150
150	2	10	Jetstream2 GPU	3,000	32 (g3.large)	96,000

Start-Up Opportunity

Resource Testing and the Start-Up Opportunity

Concretely demonstrate aspects of **feasibility**, **project readiness**, and **need for resources** by first testing your computational work!

- Test on the same or similar resources and track costs/usage.
- Test a series of computations that use variously-sized subsets of data, parameters, tokens, or other components, to extrapolate your full-scale needs.
- Test for each method, project phase, and/or computation type.

A NAIRR Pilot Start-Up Allocation is now available [NEW!]

https://nairrpilot.org/opportunities/startup-project

- For shorter projects (up to 3 months) using one resource.
- Get acquainted with a resource, build your execution environment, scale-test and/or benchmark.
- Online form and optional 1-page document reviewed within 2 weeks.

Other Relevant Computing Resources

Government-Funded Resources vary in eligibility based upon scholarly domain/mission, and/or funding from the same agency

- NSF ACCESS Program https://allocations.access-ci.org/ (prior funding not required)
 - o allocates NSF-funded computing resources (including some NAIRR Pilot resources)
- NSF Partnership to Advance Throughput Computing (PATh) https://path-cc.io/
 - high-throughput computing and data sharing resources; some require funding and/or application
- NIH Cloud Lab https://cloud.nih.gov/resources/cloudlab/
- DOE Leadership Computing Facilities
 - Argonne Leadership Computing Facility (ALCF) AI Testbed https://www.alcf.anl.gov/alcf-ai-testbed
 - National Energy Research Scientific Computing Center (NERSC) https://www.nersc.gov/
 - Oak Ridge Leadership Computing Facility (OLCF) https://www.olcf.ornl.gov/

Commercially-Available Resources

 Most have no-charge, quick options for modest research and education purposes, and/or testing.

Getting Help

- NAIRR Pilot Website https://nairrpilot.org/
 - The Resource Opportunities provide lists of resources, documentation, and proposal instructions.
 - The Previous Awards page provides information on what projects and resources have been awarded.
- Read the Frequently Asked Questions https://nairrpilot.org/help/faq
- Check the Events and Training page for this and other training events and office hours
 - https://nairrpilot.org/pilotevents
- Attend the NAIRR Pilot Office Hours
 - Currently 2nd Tuesday and 4th Wednesday of every month, 12 PM PT/3 PM ET check the NAIRR website for registration: https://nairrpilot.org/help/office-hours
- Submit a NAIRR Pilot Ticket
 - On the NAIRR Pilot website, navigate to "Help" and "Submit a Ticket", or visit
 - https://nairrpilot.org/open-support-request

Wrap Up

- This is a resource-request proposal, not a research or classroom proposal.
 Follow the instructions, and adjust appropriately.
- Demonstrate that you are immediately able to start using the resources.
- Provide detailed justifications and calculations for your resource request.
- Show your calculations.
- Ask for help, leverage office hours.

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Other **Questions?**

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Extra Slides

Submitting an Allocation Request Demo: https://nairrpilot.org

Demo – Resources

- Login to the website the primary identity is your ACCESS ID.
- Click on Current Opportunities -> Researcher Resources Opportunity.
 - This is where the Opportunity details are
- Available Resources
 - Touch on unique resources (Cerebras, Chameleon, FABRIC)
 - Note, FABRIC has unique requirements
 - Open Indiana Jetstream2 GPU each resource description is different
 - Resource Description contains the details of the resource
 - Allocation Description describes the allocation.
 - NCSA Delta GPU: traditional HPC note the link to the user guide.

Demo – Submission

- Expectations of Projects: More requirements. Note link to more instructions
- Click Start your Submission -> Start a New NAIRR Pilot Submission (Researcher Resources)
 - Request Information: Title, Abstract, Keywords, Field of Science
 - **Project Personnel:** Project Lead (Timothy Middelkoop), Project Admin (Lauren Michael)
 - Other Collaborators: List project team here: John Hicks, Internet2, jhicks@internet2.edu
 - Supporting Grants: National Science Foundation; EAGER, Dana Brunson, Grant Number: 2435057
 - Available Resources: Look here for requirements before testing and submission
 - **DOE Argonne** example of detailed information
 - **Jetstream2** example of specifying SU's, Use GPU-hours in proposal and convert to SU's.
- **Documents**: Proposal, Project Lead CV/Biosketch.
- Attestations: Read carefully
- Save! Submit!