

# Illinois Computes

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UNIVERSITY OF  
**ILLINOIS**  
URBANA-CHAMPAIGN

# Meeting purpose & agenda

## *Illinois Computes Information & Implementation*

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1. Welcome
2. Illinois Computes overview
3. Strengthen research, partnership, discovery & prestige
  - Infrastructure/hardware + future investment
  - Support, facilitation, consulting & success stories
4. What are you hearing that we didn't touch on?

# Do you know researchers who...

- have maxed out the **computational** power of their laptop, desktop, or closet system?
- need **storage** for research data?
- request **domain expertise** beyond what your staff can provide?

...Illinois Computes might be able to help!

# Illinois Computes

<https://computes.illinois.edu/submit-a-request/>



## Request Instructions

1. Get an [NCSA identity account](#) (kerberos) or reset your account credentials [here](#)
2. Use your NCSA identity to log into the submission site called [XRAS](#)
3. Select “Illinois Computes Program”
  - Then select which computing, storage and/or consulting resources you are interested in using.
  - If you don’t know what you need, or need help, select “NCSA Consulting Services”

### Illinois Computes Program




Submission Begin Date: 2023-02-16    Submission End Date: 2027-08-31

Start a New Illinois Computes Program Submission ?



Authentication with Illinois credentials coming soon!

# Illinois Computes \$50M over 5 years

 <div>UNIVERSITY OF <b>ILLINOIS</b> URBANA-CHAMPAIGN</div>	<div>Urbana campus \$30M</div> <div>Even split between hardware and consulting support</div>
<div></div> <div>UNIVERSITY OF ILLINOIS SYSTEM</div>	<div>Illinois System \$20M</div> <div>Hardware</div>

Governance

Campus & System Advisory Boards

In addition to existing partnerships		RESEARCH IT	 <div>Illinois Campus Cluster Program AT THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN</div>
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# Illinois Computes by the Numbers



Strengthen  
Research

**135** New Projects  
on Computing  
or Data  
Systems

**198** Support  
Requests

**42** Departments or  
Research Units  
Served

**30+** Referrals to  
Delta through  
ACCESS

**32** Ongoing  
Collaborations

**9** Out of 14  
Colleges

# Training & Documentation



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Research

**20**

Live Trainings/yr.

**921**

Registrants

- GPU programming
- Machine learning
- Parallel programming
- Python profiling tools
- and more

**17**

Asynchronous Trainings/yr.

**450**

Enrollees

- Getting Started on Campus Cluster
- Using Delta
- and more



# Engagement & Listening across Campus

- IT community
- Faculty across all of campus
- Existing research computing & data users
- Graduate students and postdocs
- College Research offices
- Research collaborations
- Connecting experts



Strengthen  
Partnership

## What approaches work best?

### Push

- Email
- Social media
- News and reports

### Pull

- Digital signs
- Website
- Documentation
- Surveys

### Interactive

- Roadshow meetings
- Training
- Consultation
- Listening to feedback



# What is the best way to engage with you and your researchers?



## What is the best way to engage with you & your researchers?

Nobody has responded yet.

Hang tight! Responses are coming in.

# How can we partner together?

1. Join us on the Research Community Support monthly call + email distribution list led by Research IT
2. Help researchers submit requests for computing, data, and/or support
3. Encourage and/or complete the Illinois Computes Needs Survey and the Satisfaction survey
4. Spread the word about our campus offerings
5. Invite us to share more information at a meeting

# Illinois Computes

## Strengthen



Research



Partnership



Discovery &  
Prestige

# Computing and Data - Our Approach

- Baseline level of research computing and storage
- Complement existing solutions across campus
  - In partnership with units across campus, including Research IT and ICCP
- Does not replace unit and researcher systems/purchases
- Make existing resources available
  - general compute, on-prem cloud, regulated computing, etc
- Data-driven decisions on hardware\*
- Identify and create broadly applicable services
- Reminder: resources are intended for research use only
  - However, we want to hear your instructional needs!

\*Note: we will use early usage data on existing systems and requests we are unable to meet to guide future hardware purchases



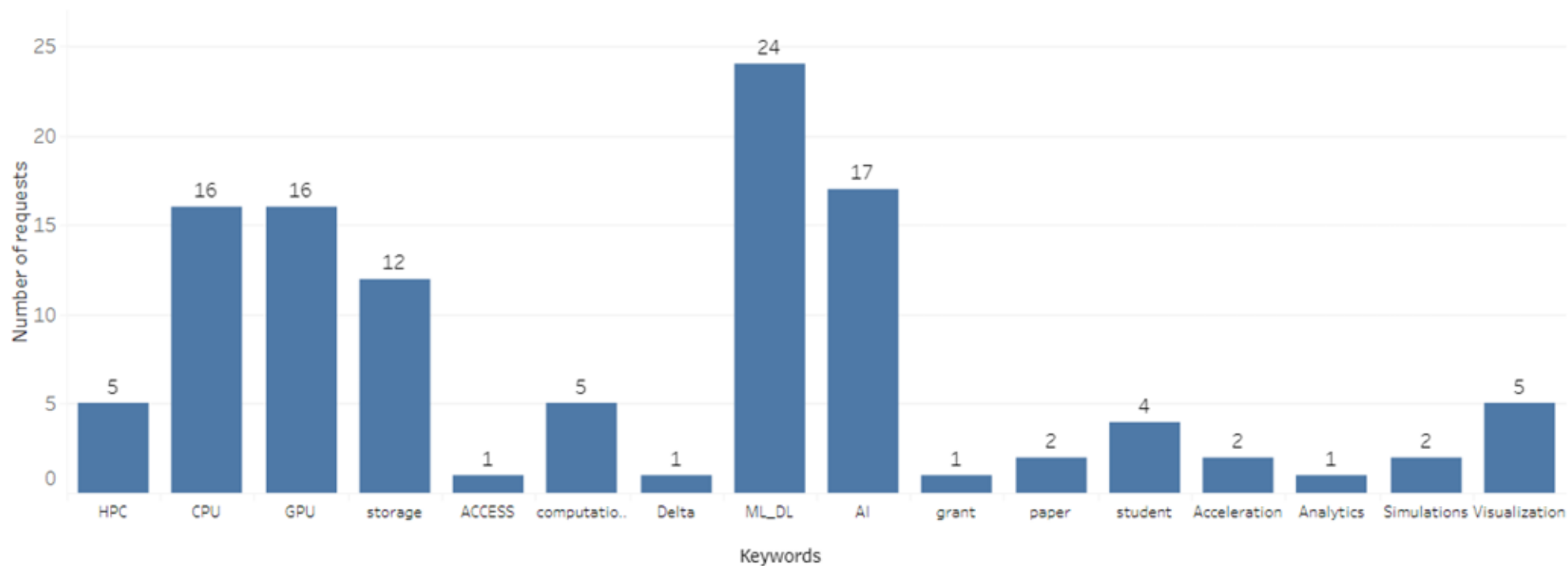
Strengthen  
Research

Mining of keywords draws a clear picture that most of the requested support is geared toward machine learning applications and Data-Driven research. Keywords such as ML/DL, GPUs, and CPUs are ranked the most frequently found in requests. Furthermore, since machine and deep learning applications are guided by a large volume of data this is reflected also in the increase of the demand for data storage across most of the requests.



## Strengthen Research

Keywords Mentioned in Requests  
Frequency of keywords (as of 10/27/2023)



Source: NCSA Research Consulting Illinois Computing Jira

# Needs Survey

- Only a few responses so far but would love more!
- Scan the QR Code for the link:



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Research

# ACCESS to Delta & DeltaAI

The largest requests to Illinois Computes will be referred to national allocations

- NSF-funded national computing resources
- **Delta:** A GPU-rich mixed computing system
  - 840 Nvidia A100 GPUs within 205 nodes complemented by 132 CPU-Only Nodes
- **DeltaAI:** A uniform GPU-Only, AI-Focused computing system
  - 320 Nvidia Grace-Hopper “superchip” processors within 80 nodes
- **More information:** <https://delta.ncsa.illinois.edu/>



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Research



# ACCESS to Larger Allocations

**ACCESS** When general use exceeds our baseline threshold levels, we send to ACCESS through one of the following opportunity types to receive credits:

- [Explore ACCESS](#) - 400,000
- [Discover ACCESS](#) - 1,500,000
- [Accelerate ACCESS](#) - 3,000,000
- [Maximize ACCESS](#) - requests made in service units



ACCESS resources list: <https://allocations.access-ci.org/resources>

**Frontera** Can pull allocations from the "Maximize" level for ACCESS requests

**Incite** Generally for extreme GPU needs (beyond even Delta)



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Research

# Hardware Available Today

Name	Capabilities	Use Model	Details
Nightingale	Mixed CPU/GPU, HIPAA compliant, ePHI/CUI secure	Batch/ Interactive	Suitable for HIPAA, CUI, FERPA
Radiant	On-Prem VM Cloud – OpenStack	Interactive	31,000 vcpus, 8 vGPUs
ICRN	Jupyter Notebooks	Interactive	highly scalable
Hydro	Mixed CPU/GPU for MPI/AI/ML	Batch	55 nodes incl 18 A100
Holl-I	Cerebras CS-2 – Extreme Scale ML	Batch	850,000 custom cores
Taiga/Granite/Jade	Data Storage Services – Disk and tape	Shared File System	18PB disk; 40PB tape; controlled tape
Campus Cluster	Mixed CPU/GPU “condo style” cluster	Batch	16 nodes purchased for campus use



# ICRN- Illinois Computes Research Notebooks.



- **Purpose** – Free Jupyter notebooks for researchers
- **Key Benefits:**
  - **Open to All Researchers:** Accessible to any researcher in need of a basic computational resource.
  - **User-Friendly:** Offers a user-friendly, intuitive Jupyter notebook environment.
  - **Go remote:** Provides sufficient resources to replace local code execution
  - **Instant Access:** Immediate access upon login.
  - **Resource Allocation:**
    - Up to 4 CPU cores.
    - Up to 8GB RAM.
    - 100GB of persistent storage (ICCP filesystem).
    - GPUs (coming soon).

**Get access now!**

<https://go.ncsa.illinois.edu/jupyter>



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Research**

# ICCP - Illinois Campus Cluster



- **Shared Infrastructure:** Illinois Campus Cluster provides a shared infrastructure to power research projects.
  - Researchers can invest in compute nodes and storage. Hardware is owned by the investor, operated by the Campus Cluster program
  - Illinois Computes now covers **all** infrastructure fees! This allows researchers to purchase more compute/storage
- **Illinois Computes Investment:** 16 compute nodes with 5TB of storage.
  - GPUs coming soon!



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# Illinois Computes

**What kinds of computing, storage, and support services are missing or needed?**



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# Research Consulting at NCSA

## User Support

- Help desk
  - Access, sys. monitoring
- Computing environments
  - Compilers, libraries, I/O
  - Allocations
- Jobs
  - Scripts, queues, web interfaces
- Facilitation
- Training
- Documentation

## Research Solutions

- Code dev. & improvements
  - Debugging, profiling, development
- Software & applications
  - Installs, maintenance, validations, benchmarks
- Advanced support
  - Numerical methods, accelerated computing, advanced programming & visualization
- Domain expertise and consulting
  - Modeling/Simulation, Genomics, Data Analytics, Machine Learning, GIS, Physics, Engineering, Astronomy
- Interdisciplinary computation

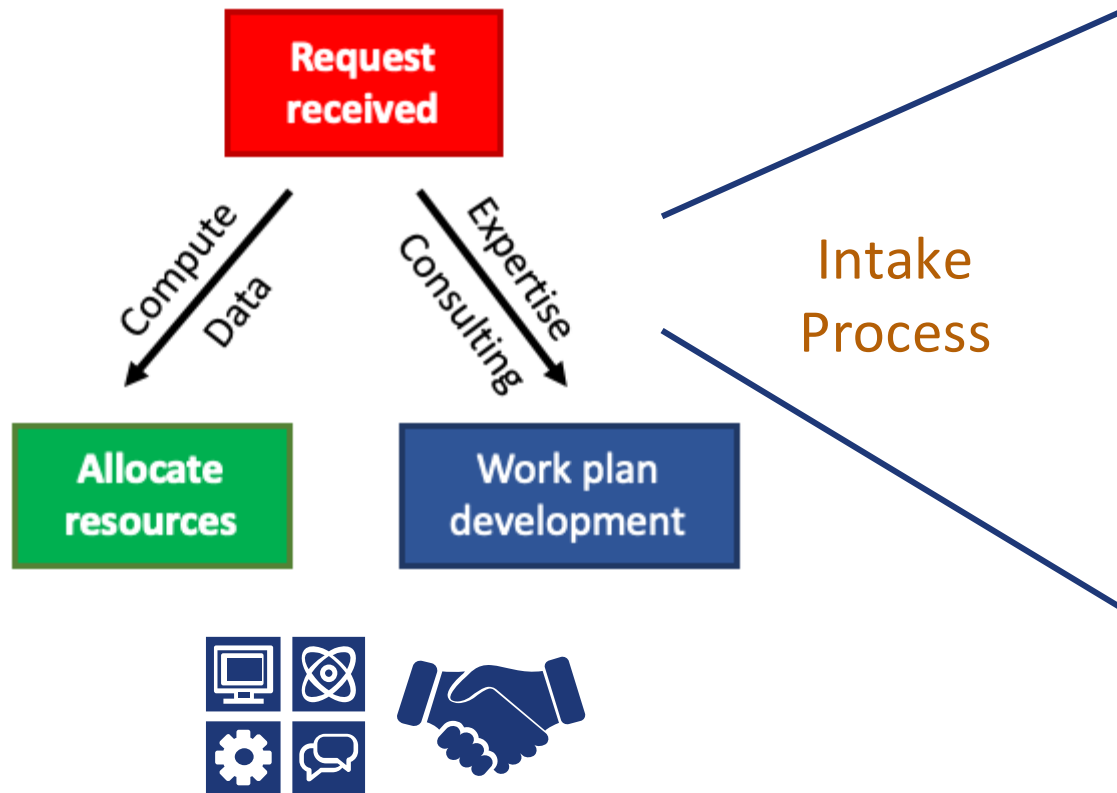
## Outreach

- Grant collaboration
- Student talent & workforce development



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Research

# Research facilitation



Strengthen Research and Partnership

- Uniform framework to collect relevant information about the project
- Identify the barriers and problems the researcher is facing
- Start to come up with a plan to address these problems
- Build a relationship with the researcher

# Facilitated computing resources story



## Incoming situation

Researcher uses machine learning methods for genomics studies

- Python scripts running on Google Colab notebooks
- Pays out of pocket for GPUs
- Larger calculations are performed on a workstation at a different institution

## Facilitation process

Identify appropriate resources

- Python scripts **and** larger calculations can run on local HPC resources at no cost
- Migration of scripts requires assistance from an expert

## Results

- Scripts completely migrated to run on HPC
- Containerization for complete portability
- Improved performance without GPUs



# Facilitated research consulting story



## Incoming situation

Researcher approaches Illinois  
Computes looking primarily for  
compute resources

- Uses local workstations to process high-resolution images
- Trains ML models using geospatial information techniques

## Facilitation process

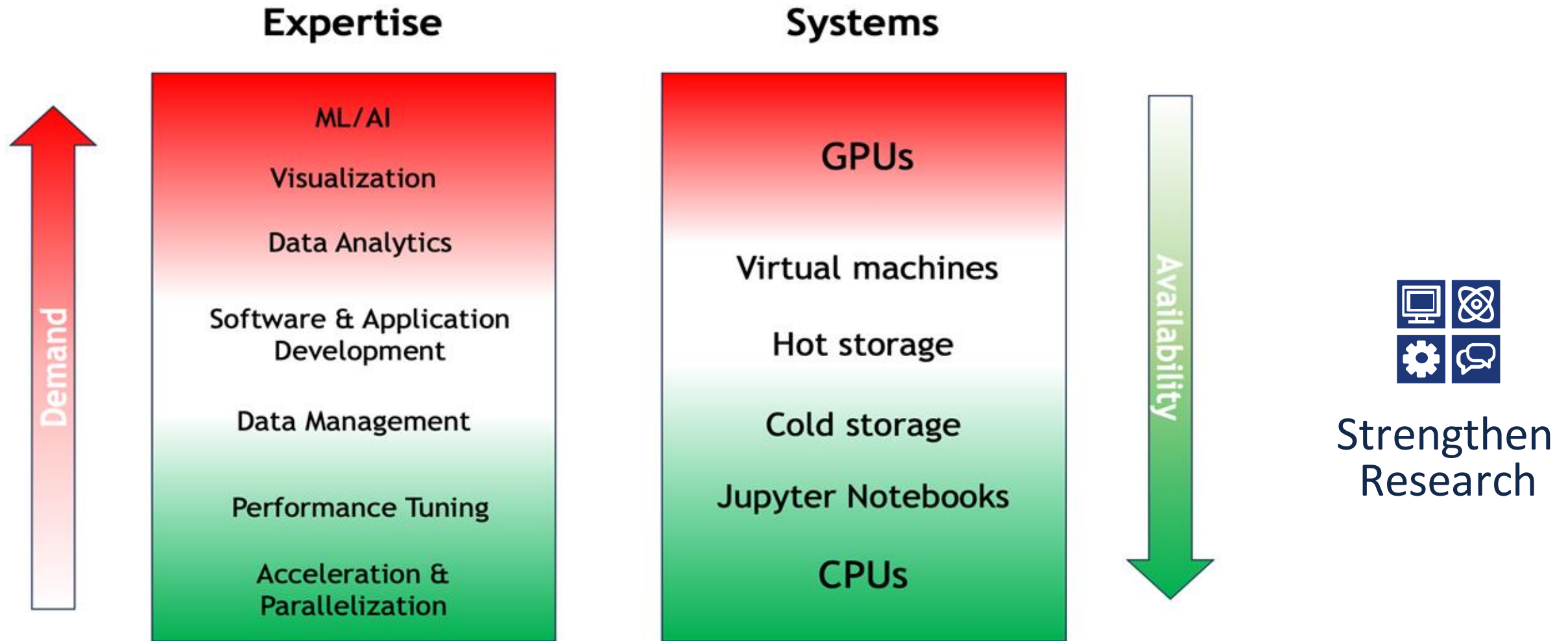
Identify appropriate resources

- Campus Cluster: more processing power and storage
- Facilitator identifies NCSA expert with similar interests and experiences
- Researcher and NCSA expert are connected

## Results

- Storage and computing resources allocated and being used
- NCSA expert and research developed a work plan and are currently collaborating

# Illinois Computes: requests overview



# Success Stories: how others have engaged with Illinois Computes

- AI/ML on a computing project between computer science, mechanical engineering, and materials science
- Identify localized biomarkers and improve the resolution of spatial scans in geographic information science
- Analyze large datasets to answer bioinformatics questions
- Visualize 2D and 3D data models of wireless signals for computer science
- Overlay several visualizations of terrain and atmospheric data
- Compute on a HIPAA-certified system
- Store data
- So much more!



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# Illinois Computes

Submit a request	<a href="https://computes.illinois.edu/submit-a-request/">https://computes.illinois.edu/submit-a-request/</a>	
Needs survey	<a href="https://go.ncsa.illinois.edu/IllinoisComputesNeedsSurvey2023">https://go.ncsa.illinois.edu/IllinoisComputesNeedsSurvey2023</a>	
Training, documentation & support	<a href="https://computes.illinois.edu/expertise-user-support/">https://computes.illinois.edu/expertise-user-support/</a>	
Compute & storage options	<a href="https://computes.illinois.edu/compute-and-storage/">https://computes.illinois.edu/compute-and-storage/</a>	

**What did we miss?**

**What are you hearing that we didn't touch on?**

