From Physics to Research Computing

An Early-Career Perspective on Entering RCD

Smita Darmora
Computational Scientist
Advanced Cyberinfrastructure for Education and Research (ACER)
University of Illinois Chicago

MIDWEST RCD CONSORTIUM ANNUAL NETWORK MEETING
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From User to Facilitator

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A journey through physics, discovery and computing

1

Chapter 1 · The Spark

PhD – UT Arlington · ATLAS Experiment · CERN

- Introduction to HTCondor · Grid job submission

2

Chapter 2 · Going Global

Postdoc – ATLAS Distributed Computing Operations

- Monitoring distributed jobs across WLCG sites

3

Chapter 3 · Deep Dive

Postdoc / Research – Argonne

- MadGraph simulations · HPC workflows

4

Chapter 4 · The Bridge

Fermilab – Scientific Computing

- First experience supporting HPC users

5

Chapter 5 · The Guide

Today – UIC ACER

- Supporting researchers using HPC systems

Having been on both sides — as a domain researcher and now as RCD staff — I've noticed some patterns worth talking about

My job was to find new physics at the edge of human knowledge. The thing standing between me and that goal was a batch scheduler I didn't understand.

The First Day on the Cluster

✅ What I Knew

- Strong domain knowledge (physics, biology, chemistry)
- Some scripting experience (Python, R, MATLAB)
- Used to running jobs locally on my laptop or lab machine

⚡ What Blindsided Me

- No GUI—just a terminal
- My code worked on my laptop, but broke on the cluster
- Didn't know what a scheduler was or why I needed one
- Software I relied on wasn't installed, or wrong version
- Documentation assumed knowledge I didn't have yet

"Nobody tells you that moving your analysis from your laptop to a cluster is not just a technical step — it is a completely different way of thinking about computing."

When Your Code Meets the Cluster

The technical reality most researchers aren't prepared for

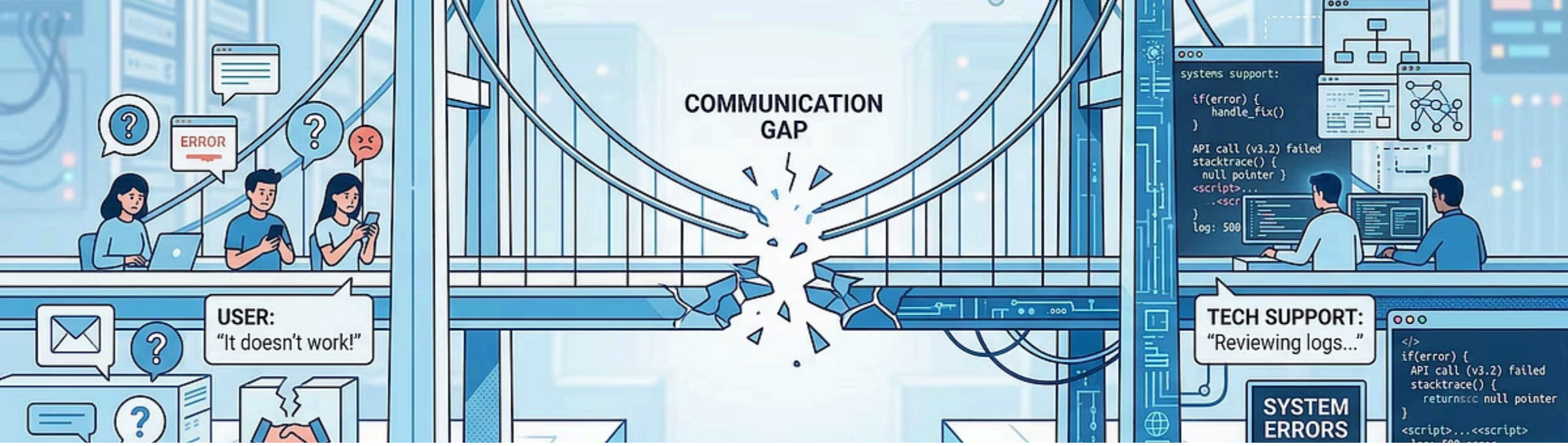
Software & Environment Issues

- Conflicting dependencies — what worked locally breaks on shared systems
- Module systems are unfamiliar — don't know what to load or why
- No admin rights — can't just "install" what they need

Workflow Translation

- Local scripts don't translate directly to batch job submission
- HTCondor, SLURM, PBS — every cluster speaks its own language
- Debugging a failed job is much harder than debugging local code

"Moving to a cluster isn't just a technical step — it's stepping into a different world with different rules"



The Invisible Barriers

When the challenge isn't the technology — it's navigating the system around it

Data & Storage Confusion

- Scratch vs. home vs. project storage — no one explains the difference
- Large datasets are hard to move across systems
- Files disappear after scratch purge — researchers rarely warned in advance

Documentation Gap

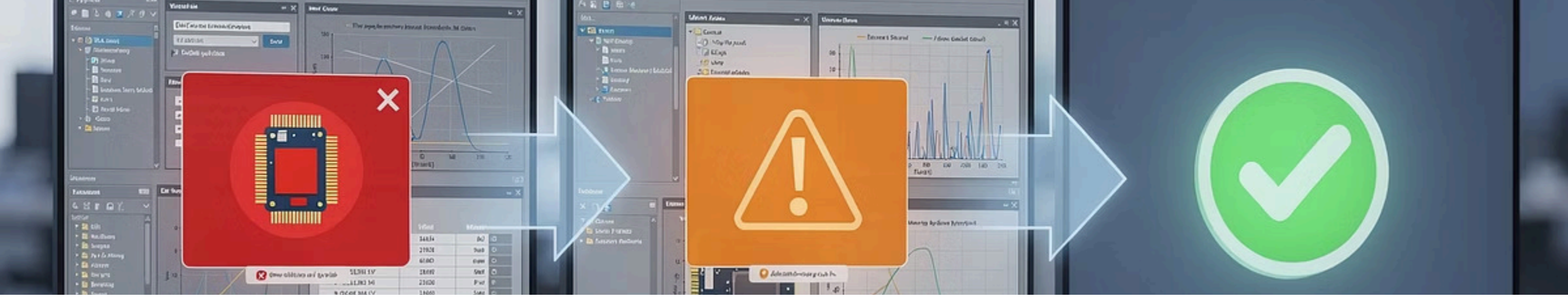
- Lots of documentation — but no map to navigate it
- Written for people who already understand the system
- Hard to know which page applies to your specific problem

Not Knowing How to Ask

- Ticket systems feel formal and intimidating for a simple question
- Researchers don't always have the right vocabulary to describe their problem

Communication Mismatch

- Researcher says "it doesn't work"
- RCD staff needs — error message, job ID
- Neither side realizes they are speaking different languages



One Ticket. Three Lessons

A recent support experience that brought it all back

The Initial Ticket

- User could not run MATLAB on GPU
- Default allocation gave a sliced GPU — MATLAB does not support sliced GPUs
- Fix: request a full GPU → it worked

But Then...

- Crashed after 5 minutes
- Default memory allocation was too low
- Fix: request higher memory → now working

What I Realized

- The user was asking exactly the way I used to ask
- They were not missing knowledge — they were missing context
- I stopped assuming background knowledge and started from basics
-

"When I recognized myself in that ticket, I understood what good support actually means."

What Researchers Actually Need from Us

Not more documentation — more connection

Start from zero, not from the system

- Don't assume any HPC background
- First interaction sets the tone for everything that follows
- warm welcome email beats a link to documentation

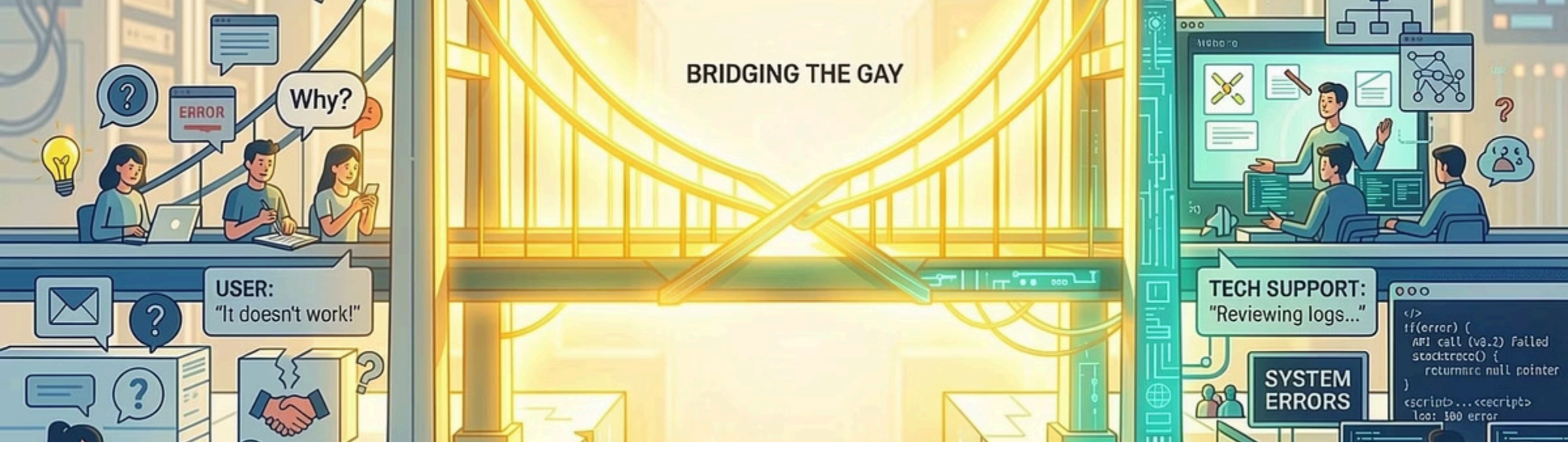
Make it safe to ask basic questions

- No question is too basic — researchers are experts in their field, not in HPC
- Office hours
- Frame support as a conversation, not a correction

Explain the why, not just the how

- A fix without context will need to be fixed again
- Context builds confidence — confidence builds independence

"The goal is not to solve their problem. It is to help them understand the system they depend on."



What I Would Tell Both Sides

Practical ways to lower barriers and improve collaboration

For Researchers

- you will not break the system
- Ask questions early and often — no question is too basic
- Ask why, not just how

For RCD Staff & Facilitators

- Never assume background knowledge
- Regular tutorials lower barriers before problems happen
- When a group reaches out — go to them

"I have been on both sides. The gap closes faster than you think — when both sides take one step toward each other."

Advanced Cyberinfrastructure for Education and Research (ACER)

Technology Solutions

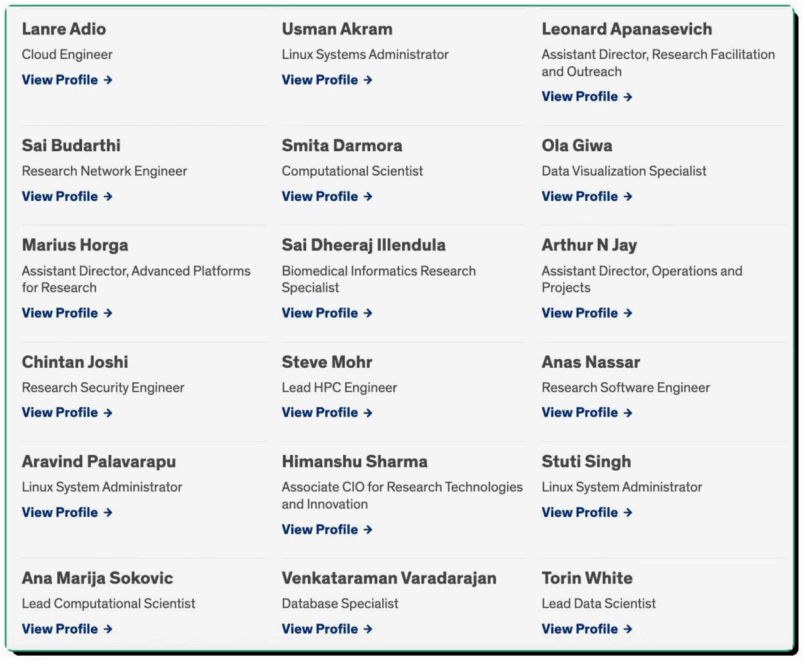
A diverse team, built around researcher needs

Our Team

- 18+ specialists, data science, software engineering, networking, security and visualization
- Diverse backgrounds — bringing multiple perspectives to researcher support

What We Do

- Every semester — webinar series based on researcher feedback
- In-person consultations when labs and research groups reach out



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Cloud Engineer
View Profile →

Usman Akram
Linux Systems Administrator
View Profile →

Leonard Apanasevich
Assistant Director, Research Facilitation and Outreach
View Profile →

Sai Budarthi
Research Network Engineer
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Ola Giwa
Data Visualization Specialist
View Profile →

Marius Horga
Assistant Director, Advanced Platforms for Research
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Aravind Palavarapu
Linux System Administrator
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Himanshu Sharma
Associate CIO for Research Technologies and Innovation
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Linux System Administrator
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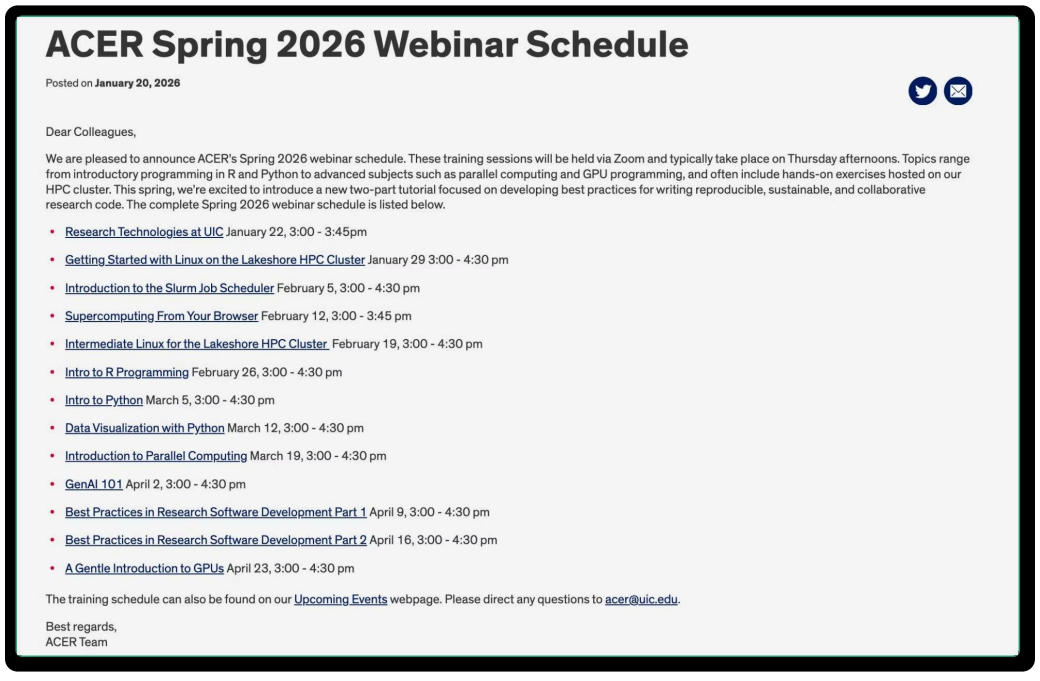

ACER Spring 2026 Webinar Schedule

Posted on **January 20, 2026**

Dear Colleagues,

We are pleased to announce ACER's Spring 2026 webinar schedule. These training sessions will be held via Zoom and typically take place on Thursday afternoons. Topics range from introductory programming in R and Python to advanced subjects such as parallel computing and GPU programming, and often include hands-on exercises hosted on our HPC cluster. This spring, we're excited to introduce a new two-part tutorial focused on developing best practices for writing reproducible, sustainable, and collaborative research code. The complete Spring 2026 webinar schedule is listed below.

- Research Technologies at UIC January 22, 3:00 - 3:45pm
- Getting Started with Linux on the Lakeshore HPC Cluster January 29 3:00 - 4:30 pm
- Introduction to the Slurm Job Scheduler February 5, 3:00 - 4:30 pm
- Supercomputing From Your Browser February 12, 3:00 - 3:45 pm
- Intermediate Linux for the Lakeshore HPC Cluster February 19, 3:00 - 4:30 pm
- Intro to R Programming February 26, 3:00 - 4:30 pm
- Intro to Python March 5, 3:00 - 4:30 pm
- Data Visualization with Python March 12, 3:00 - 4:30 pm
- Introduction to Parallel Computing March 19, 3:00 - 4:30 pm
- GenAI 101 April 2, 3:00 - 4:30 pm
- Best Practices in Research Software Development Part 1 April 9, 3:00 - 4:30 pm
- Best Practices in Research Software Development Part 2 April 16, 3:00 - 4:30 pm
- A Gentle Introduction to GPUs April 23, 3:00 - 4:30 pm

The training schedule can also be found on our Upcoming Events webpage. Please direct any questions to acer@uic.edu.

Best regards,
ACER Team

We build the bridge before researchers reach the gap

Job Complete

Final Status Report for talk_status.sh

```
$ talk_status.sh --speaker=Smita

Status:        COMPLETED ✓
Exit code:     0
Time elapsed:  10 mins
Queue wait:    0
Errors:        None
Warnings:      None
```

May your jobs never fail, your memory never run out, and your error logs always make sense.

Thank you! Questions welcome.

Technical Walls Researchers Hit

Navigating the hidden complexities of High-Performance Computing

Software & Environment Issues

- Conflicting dependencies – what worked locally breaks on shared systems
- Module systems unfamiliar – don't know what to load or why
- No admin rights – can't just "install" what they need

Workflow Translation

- Local scripts don't translate directly to batch job submission
- HTCondor, SLURM, PBS – every cluster speaks its language
- Debugging a failed job is much harder than debugging local code
- Long queue wait times break the research iteration cycle

Data & Storage

- Scratch vs. home vs. project storage — confusing and undocumented
- Moving large datasets across systems is non-trivial
- Files disappear after scratch purge — nobody warned them

> "The technical barriers are real — but what makes them harder is that researchers don't know what they don't know."

The Invisible Barriers

Beyond the technical challenges, researchers often face non-technical hurdles that hinder their progress and discourage seeking help.

Documentation Gap

- Written for people who already understand the system
- Assumes baseline knowledge most STEM researchers don't have
- Lots of documentation, but no map to navigate it

Communication Mismatch

- Researcher says "it doesn't work".
- RCD staff needs — OS, error message, job ID, code snippet
- Neither side realizes they are speaking different languages.

Not Knowing Who or How to Ask

- Ticket systems feel formal and intimidating for a simple question
- Researchers don't know the right vocabulary to describe their problem

Isolation

- No community or peer group to turn to
- Early-career researchers especially feel they should already know this
- The learning curve feels personal, not systemic

The hardest barrier is often not the technology — it is not knowing how to ask for help.

Practices That Made a Difference for Me as a User

Add a simple "When your job fails" troubleshooting guide

Short page with common errors and the first things to check.
Link directly from scheduler documentation.

Avoid replies "See documentation."

Link the exact section and explain why it applies.

Hold short drop-in office hours.

Include workflow-oriented examples in documentation

In onboarding, say explicitly:

"You won't break the system. Please ask questions early."

💡 **Small communication and documentation practices can make HPC systems much easier for new users to navigate.**

Looking at the System Behind User Challenges

Effective support for HPC users requires understanding not just the symptoms, but also the underlying systemic issues and how high-performing teams address them.

🔍 What We Often See (Visible)

- Users struggle to submit jobs correctly
- Repeated support tickets for similar issues
- Long delays before a first successful job
- Some researchers eventually stop using HPC

🕵️ What May Be Happening Underneath

- Docs not connected to real workflows
- Onboarding leaves new users unsure where to start
- Support focuses on fixing, not explaining
- Users hesitate to ask questions
- Ticket patterns rarely feed back into improvements

✅ What Effective Teams Tend to Do

- Treat user experience as infrastructure
- Review docs regularly, like system components
- Use ticket trends to identify missing guidance
- Ask why mistakes are easy to make

What I Carry from Both Sides

As a User

- I wasn’t looking for hand-holding but for **context.**
- I wanted to understand the system I depended on.
- I wanted to know it was okay **not to know everything immediately.**
- I wanted documentation that helped translate system concepts into real use.

As a Facilitator

Every ticket I receive, every researcher I work with, I see that earlier version of myself again.

So I ask myself:

- Am I just giving them the answer?
- Or am I helping them build the capacity to find the next answer themselves?

My experience as a user still shapes how I try to support others today..

Research Computing Support at UIC (ACER)

At the ACER group at UIC, we support researchers across many disciplines.

Our team brings together expertise in:

- High-Performance Computing
- Research Software & Workflows
- Data Science & Visualization
- Networking & Infrastructure
- Security & Research Data

Our Team

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Supporting researchers requires both infrastructure and people.