ECOSYSTEM for RESEARCH NETWORKING

"Beyond Resources: Integrating AI, Quantum, and the Workforce of the Future"

WORKSHOP REPORT

ERN Summit 2026 (Virtual)
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ABSTRACT

This document reports on the Ecosystem for Research Networking Summit (virtual) that took place April 22, 2026.

1. EXECUTIVE SUMMARY

The Ecosystem for Research Networking (ERN) is a community-driven consortium dedicated to simplifying multi-campus collaborations and advancing research, pedagogy, and innovation through shared access to research resources, cyberinfrastructure, expertise, and partnerships. Grounded in a mission to democratize access to research instruments, data, computing, and technical knowledge, ERN responds to the growing demands of data-intensive, compute-driven science, where no single institution can independently meet the full scale of infrastructure, expertise, or workforce needs. By fostering close collaboration among researchers, cyberinfrastructure professionals, institutions, regional networks, industry partners, and national organizations, ERN enables inclusive, cross-institutional participation in increasingly complex and interdisciplinary research environments.

Building on this foundation, the ERN Summit 2026 was held virtually on April 22, 2026, and convened leaders from academia, industry, national organizations, and the broader research cyberinfrastructure community to examine how artificial intelligence, quantum technologies, advanced computing, data ecosystems, and workforce development are reshaping institutional, regional, and national research ecosystems. Co-chaired by Forough Ghahramani of NJEdge and Maureen Dougherty of ERN, the Summit examined existing programs and emerging opportunities to expand access to cyberinfrastructure, accelerate multi-campus collaboration, and strengthen workforce development, with particular attention to inclusion across research-intensive institutions, smaller and/or under-resourced institutions, and public-private partnerships.

The 2026 Summit marked a defining inflection point in the evolution of the national research cyberinfrastructure landscape. Over the past several years, substantial federal investments through initiatives such as NSF ACCESS, the NAIRR Pilot, and Department of Energy programs have significantly expanded the availability of advanced computing, AI, data, and related research resources. These investments have created important new opportunities for researchers and institutions. However, the Summit made clear that the central challenge has shifted. The question is no longer simply whether resources exist or whether access can be granted. The more urgent question is whether researchers, institutions, and communities have the support, preparation, workflows, and workforce capacity needed to use these resources effectively.

Across the keynote presentation, expert panels, and open community dialogue, participants consistently emphasized that infrastructure must be understood as a socio-technical system. Hardware and software remain essential, but they are not sufficient on their own. Impact depends on training, facilitation, workflow alignment, governance, institutional readiness, user support, and trusted relationships between researchers and cyberinfrastructure professionals. Without these enabling conditions, even well-funded infrastructure risks remaining underutilized or inaccessible to the very communities it is intended to serve.

This dynamic was captured succinctly during the discussion: “If they can’t use the system they are given access to, they will still walk away, because time is more valuable for a PI than the access.” This observation reflected a recurring theme throughout the Summit: access must be paired with usability, support, and relevance to researchers’ actual workflows. For faculty, students, and research teams, time, confidence, and practical usability are often as important as the technical availability of advanced resources.

The Summit’s discussions surfaced seven cross-cutting themes that should inform ERN’s priorities and the broader national cyberinfrastructure agenda going forward:

- **From Access to Enablement:** National initiatives have expanded access to advanced computing, AI, and data resources, but access alone does not ensure adoption.

Researchers need onboarding, training, consultation, facilitation, and workflow-aligned support to use these resources effectively.

- **Ecosystems as the Unit of Innovation:** The complexity of AI, quantum, and data-intensive research requires collaboration across institutions, sectors, and regions. Effective innovation now depends on coordinated ecosystems that bring together academia, industry, national laboratories, community colleges, and regional partners.
- **Integration Over Replacement:** Emerging technologies such as quantum computing are not replacing existing systems; they are being integrated into heterogeneous environments that combine CPUs, GPUs, QPUs, AI-driven orchestration, and advanced workflows. This integration-oriented approach provides a more practical and scalable path forward.
- **Workforce as Critical Infrastructure:** The Summit emphasized that people are as essential as platforms. Research Software Engineers, Campus Champions, AI facilitators, data professionals, and other technical experts are critical to translating infrastructure into research impact, yet many of these roles remain under-recognized and under-supported.
- **Data as the Primary Bottleneck:** As AI-driven research expands, data management, metadata, governance, interoperability, security, and trust have become central challenges. Without robust and well-governed data ecosystems, even the most advanced computing resources will be limited in their impact.
- **Regional Models as Bridges to National Infrastructure:** Regional initiatives play an essential role in connecting national resources to local institutional needs. They provide the training, coordination, governance, and user support needed to engage smaller, under-resourced, and non-R1 institutions more effectively.
- **Sustainability and Long-Term Investment:** Many cyberinfrastructure efforts depend on grant-funded programs, raising questions about long-term sustainability. The Summit underscored the need for funding models that combine federal investment, institutional commitment, regional coordination, and private-sector partnerships.

The Summit agenda connected diverse stakeholder perspectives and highlighted the converging impact that AI and quantum technologies are having on cyberinfrastructure, research computing, data ecosystems, and workforce development. Framed by keynote insights from Dr. Masoud Mohseni, Director of HPE Quantum, and three expert panels, the Summit explored how tightly coupled advances in AI and quantum are reshaping infrastructure requirements, support models, and access strategies. Discussions addressed hybrid computing environments, data-intensive workflows, national platforms, regional ecosystems, public-private partnerships, and the need for new models of workforce preparation.

A major theme emerging from the Summit was the growing recognition of workforce as critical infrastructure. Participants emphasized that the success of national investments in AI, quantum, advanced computing, and data infrastructure depends on people who can translate technical capacity into research impact. This includes facilitators, research software engineers, data professionals, domain specialists, system architects, educators, and institutional leaders who can help researchers navigate increasingly complex technology environments. Workforce development is therefore not a secondary activity; it is central to the sustainability and effectiveness of the cyberinfrastructure ecosystem.

The Summit also highlighted the emergence of data as a primary bottleneck in AI-driven research. As AI capabilities expand, the ability to manage, curate, govern, move, share, and responsibly use data becomes increasingly important. Fragmented data ecosystems, inconsistent governance practices, uneven institutional capacity, and gaps in technical support can limit the value of even the most powerful computing resources. Participants underscored the need for coordinated approaches that integrate data infrastructure, research workflows, policy, security, ethics, and workforce development.

At the same time, the Summit emphasized a broader transition toward ecosystem-based models of innovation. Progress increasingly depends on coordinated collaboration across academia, industry, national laboratories, federal agencies, regional research and education networks, and local institutions. No single organization can independently solve the challenges associated with AI, quantum, data-intensive science, or workforce development. Effective models require alignment across sectors, shared governance, sustainable partnerships, and mechanisms that allow institutions of different sizes and capacities to participate meaningfully.

Several structural challenges remain. These include persistent workforce shortages, fragmented data environments, uneven institutional readiness, gaps in facilitation and user support, and uncertainty around long-term sustainability. Smaller and under-resourced institutions may face particular barriers in adopting and integrating advanced technologies, even when national resources are nominally available. Addressing these challenges will require deliberate attention to inclusion, regional coordination, scalable support models, and sustained investment in the human and organizational dimensions of cyberinfrastructure.

In this context, ERN's role as a convener, integrator, and ecosystem builder is more critical than ever. By aligning infrastructure, people, partnerships, and institutional needs, ERN is uniquely positioned to help translate national investments into inclusive, scalable, and sustainable impact. The Summit reinforced ERN's value as a forum where researchers, cyberinfrastructure professionals, institutional leaders, industry partners, and national stakeholders can come together to identify barriers, share models, build collaborations, and advance practical strategies for democratizing access to advanced research capabilities.

The ERN Summit 2026 ultimately underscored a clear message: the next phase of research cyberinfrastructure will be defined not only by what resources are available, but by how effectively the ecosystem enables people and institutions to use them. The future of AI, quantum, advanced computing, and data-intensive research will depend on integrated approaches that connect technology with workforce, governance, facilitation, institutional readiness, and cross-sector collaboration. ERN is well positioned to help lead this transition by advancing a more connected, inclusive, and sustainable research ecosystem.

2. CONTEXT AND OBJECTIVES

The theme of the ERN Summit 2026, *“Beyond Resources: Integrating AI, Quantum, and the Workforce of the Future”*, reflects a broader national transition in research infrastructure strategy. Over the past decade, investments have focused on building capacity: high-performance computing systems, national data platforms, and AI infrastructure. While these investments have succeeded in expanding availability, they have also exposed a new set of challenges centered on **adoption, integration, and usability**.

The Summit was designed to address this transition by bringing together leaders from across sectors to examine how advanced technologies are actually being used in practice. Rather than focusing solely on technical capabilities, the discussions emphasized **operational realities**, how researchers access systems, how workflows are constructed, and where friction points occur.

The objectives of the Summit included:

- Identifying barriers that prevent institutions from effectively utilizing national resources
- Exploring models that integrate compute, data, and workforce development
- Highlighting successful regional and ecosystem-based approaches
- Understanding the evolving role of data infrastructure in AI-driven research
- Engaging the community in shaping a more inclusive and scalable research ecosystem

A particular emphasis was placed on institutions with varying levels of readiness. While leading research universities may have the capacity to rapidly adopt new technologies, many institutions, especially community colleges, minority-serving institutions, and emerging research institutions, require additional support. Addressing these disparities is essential for achieving national-scale impact.

3. WORKFORCE DEVELOPMENT AND EDUCATION

Workforce development emerged as one of the most significant and persistent constraints on progress across the research cyberinfrastructure ecosystem. While recent infrastructure investments have expanded access to advanced computing, AI, data, and emerging technologies, the human capacity required to operate, support, and effectively use these systems has not kept pace. Participants emphasized that the workforce is not simply a supporting element of cyberinfrastructure; it is itself a form of core infrastructure. Without skilled people who can translate technical capability into usable research workflows, even the most advanced systems will fall short of their intended impact.

A central focus of the discussion was the role of **Research Software Engineers (RSEs)**. RSEs develop, maintain, optimize, and scale the software that underpins modern scientific discovery. They enable reproducibility, support complex and evolving research workflows, and bridge the gap between domain science and computational systems. Their work is essential to ensuring that advanced computing and data resources can be used reliably and effectively by researchers. Despite this critical role, RSEs are often under-recognized within academic institutions, with limited visibility, unclear career pathways, and insufficient institutional support. The Summit highlighted the need to better define, value, and sustain these roles as part of the research enterprise.

The workforce challenge extends well beyond RSEs. As AI, quantum, and data-intensive research environments become more complex, institutions increasingly need professionals who can operate across technical and disciplinary boundaries. This includes data engineers who can manage, curate, and prepare complex datasets; AI facilitators who can help researchers understand and apply machine learning tools; cyberinfrastructure professionals who can connect users to appropriate resources; and cross-disciplinary staff who can work at the intersection of science, computing, data, and institutional strategy. Recruiting and retaining this talent is increasingly difficult, particularly in competitive labor markets where industry demand for these skills remains high.

The discussions also underscored that traditional classroom-based education alone is insufficient to prepare individuals for these roles. Workforce development must be experiential, applied, and embedded in real research contexts. Effective training models should include hands-on engagement with advanced systems, mentorship from experienced practitioners, peer learning networks, and opportunities to work directly on authentic research workflows. These approaches help learners move beyond conceptual understanding toward practical competence and confidence.

Programs such as **Campus Champions**, AI facilitator models, and regional facilitator networks were identified as promising approaches for scaling expertise across institutions. These models distribute knowledge rather than concentrating it in a small number of centralized experts. They also help meet users where they are, providing local or regional points of connection between researchers and national cyberinfrastructure resources. This is especially important for smaller, under-resourced, and non-R1 institutions that may not have deep internal cyberinfrastructure staffing.

Ultimately, the Summit reinforced that workforce development must be integrated into infrastructure initiatives from the outset. Planning for advanced computing, AI, quantum, and data infrastructure must include parallel planning for the people, roles, training pathways, and professional communities needed to sustain those investments. Without this alignment, technology investments will not translate into meaningful research outcomes, broader participation, or long-term ecosystem impact.

4 PRESENTATION AND PANEL SESSIONS

Summit Welcome

Forough Ghahramani, ERN Summit Co-Chair, opened the ERN Summit 2026 by framing the event as a community-driven discussion centered on a key transition in research cyberinfrastructure. She noted that while national investments in AI, quantum, advanced computing, and data systems have significantly expanded capacity, the central challenge now lies in ensuring their effective adoption, integration, and usability across the research ecosystem. She highlighted the mission of the ERN to democratize access to cyberinfrastructure, instruments, data, and expertise, emphasizing the importance of understanding how these resources are used in practice, including system access, workflow design, and institutional readiness.

She emphasized that these challenges are closely tied to workforce development, particularly the need for skilled professionals who can support, translate, and operationalize advanced computing, AI, and quantum technologies. In this context, the Summit's goals were centered on examining these realities and generating insights to help connect national investments with institutional needs, reduce barriers to participation, and advance a more inclusive, integrated, and sustainable research ecosystem.

The agenda for the day was designed to build from this framing. The keynote by Masoud Mohseni introduced the concept of heterogeneous computing, highlighting the integration of quantum technologies with existing HPC, AI, and data ecosystems as a practical path forward. The panel discussions extended this perspective, examining how to translate access into impact through national and regional models, the role of data as both a critical enabler and bottleneck, and the importance of aligning infrastructure, workflows, and workforce capacity. Participants were encouraged to engage actively throughout the day, contributing insights to help identify actionable strategies and inform more effective, inclusive, and sustainable approaches to advancing the research ecosystem.

Opening Remarks and ERN Overview

The opening remarks and the **Ecosystem for Research Networking** (ERN) Overview were delivered by Maureen Dougherty, ERN Summit Co-Chair. The opening remarks underscored the importance of expanding the definition of research infrastructure beyond compute to include data, instruments, workflows, and human expertise. Particular emphasis was placed on the need to support under-resourced and non-R1 institutions, which represent a large portion of the national research community but often lack the infrastructure and support needed to fully participate. The concept of democratization was framed not just as access, but as meaningful participation, setting the tone for the discussions that followed.

Building on this framing, the Summit positioned the **ERN** as more than a physical or regional network. While traditional definitions of networking focus on infrastructure and connectivity, ERN was presented as both a **technical and collaborative system**, one that connects people, institutions, resources, and expertise to enable multi-campus research and shared participation in advanced scientific workflows. In this context, networking extends beyond systems integration to include the facilitation of knowledge exchange, partnerships, and coordinated engagement across a diverse set of stakeholders.

The presentation traced ERN's origins to 2017, when leaders from Rutgers University, OSHEAN, and KINBER, following participation in the National Research Platform meeting, identified the need for a collaborative regional model to support data- and computation-driven science. Initially established as the Eastern Regional Network, ERN has since evolved into the Ecosystem for Research Networking, reflecting its expanded national scope and mission to support institutions of varying sizes and capabilities across the United States.

A central theme of the overview was that democratizing access to research resources requires a broader and more integrated approach. "Research resources" were defined not only as computing infrastructure, but also as **research instruments, data sets, software environments, technical expertise, services, policies, and training frameworks**. This expanded definition reinforces the idea that effective participation in modern research requires both technical access and the organizational and human capacity to use those resources effectively.

ERN was further described as a **convener, facilitator, and integrator**, bringing together academic institutions, regional research and education networks, national cyberinfrastructure programs, core facilities, and industry partners. Its role is to reduce complexity, lower barriers to entry, and create pathways for institutions, particularly those that are under-resourced, to engage meaningfully in collaborative research.

Two key initiatives illustrated this approach. The first, the **Cloudlet / Remote Resource Access model**, enables secure, web-based access to research instruments and associated data workflows through edge computing environments. These cloudlets allow researchers to remotely access instruments that are typically restricted by institutional boundaries, while also supporting AI-enabled analysis, real-time data processing, and integration with national computing resources. The Rutgers CryoEM and Nanoimaging Facility was highlighted as a practical example of this model in action.

The second initiative, the **ERN Quantum Education Alliance**, emerged from connections formed during ERN Summit 2025. This alliance brings together academia, national laboratories, nonprofits, and industry to build a quantum-ready workforce. Its mission is to democratize access to quantum education and career pathways by aligning and leveraging existing national efforts, including the National Student Data Corps, Qubit by Qubit, MIRA, and CUDA-Q.

Together, the opening remarks and ERN overview established a clear foundation for the Summit: that advancing the research ecosystem requires more than expanding infrastructure. It requires connecting systems with people, aligning resources with real-world use, and enabling institutions to move from access to meaningful participation in research, education, and innovation.

Keynote :"Heterogeneous Quantum–Classical Computing: Scaling Through Integration"

Dr. Masoud Mohseni, Senior Distinguished Technologist and Director of HPE Quantum at Hewlett Packard Labs, delivered the keynote address, offering a forward-looking vision for the future of computing centered on heterogeneous integration. Rather than presenting quantum computing as a standalone paradigm or a disruptive replacement for classical systems, Dr. Mohseni emphasized that quantum computing is most likely to achieve practical impact through seamless integration with existing high-performance computing, AI, and advanced research networking ecosystems.

A central insight from the keynote was that the next phase of quantum computing will not be defined by hardware development alone. While continued advances in quantum hardware remain important, the broader challenge has shifted toward integration, usability, and workflow alignment. Dr. Mohseni described a future in which CPUs, GPUs, and quantum processing units (QPUs) operate together within heterogeneous computing environments, supported by AI-driven orchestration that can manage complexity, optimize performance, and connect the right computational resource to the right task.

The keynote underscored that this transition requires new software abstractions, middleware, and user-facing tools that lower barriers to adoption. For researchers and institutions, the value of quantum technologies will depend not only on the availability of quantum processors, but on whether those capabilities can be embedded into familiar research workflows. This workflow-centric approach reflects a broader shift in advanced computing: the goal is not simply to optimize individual systems, but to support end-to-end research processes across multiple computational environments.

Dr. Mohseni also emphasized the importance of incremental adoption strategies. By integrating quantum capabilities into existing HPC and AI environments, institutions can begin experimenting, developing expertise, and identifying practical use cases without requiring large-scale, standalone quantum investments. This approach lowers barriers to entry, supports institutional learning, and enables the research community to engage with quantum technologies as they continue to mature.

Using the Quantum Scaling Alliance as a case study, the keynote highlighted the value of cross-sector collaboration in reducing fragmentation and accelerating progress. The Alliance demonstrates how academia, large technology companies, quantum startups, and other stakeholders can work together to develop shared frameworks, advance research, and strengthen workforce development. This model aligned closely with the broader Summit theme that future progress will depend on integration over replacement, and on ecosystems capable of connecting infrastructure, expertise, and users across institutional and sector boundaries.

Panel 1: Building Sustainable Advanced Technologies: Industry, Academic, and National Lab Collaborations

Panel 1 explored how industry, universities, national laboratories, and startups are partnering to accelerate AI and quantum innovation while building experiential workforce pathways. The discussion emphasized that progress in emerging technologies cannot occur in isolation. Instead, it requires coordinated, cross-sector collaboration that aligns the strengths of academia, industry, government, and regional innovation ecosystems around shared goals.

A key highlight of the panel was the discussion of **DOE Project Genesis**, which was presented as a forward-looking example of how computing, data ecosystems, and institutional partnerships can be structured to accelerate scientific discovery. The discussion emphasized that Project Genesis is not focused on capacity alone, but on improving scientific productivity and impact. Its approach reflects several important priorities: integrating AI into scientific workflows, strengthening data and computing ecosystems, and developing new partnership models across sectors.

Industry perspectives, particularly from **NVIDIA**, highlighted the convergence of AI, high-performance computing, and quantum computing. The discussion underscored the growing importance of hybrid workflows that connect classical and quantum systems, including platforms such as **CUDA-Q**, which support movement across CPUs, GPUs, and QPUs. A central insight was that the long-term impact of quantum computing will depend not only on hardware advances, but on the software ecosystems, tools, and workflows that make these technologies usable for researchers and developers.

This focus on usability positioned workforce development as a central driver of innovation. Panelists emphasized that preparing the next generation of researchers and technical professionals will require more than classroom instruction. Learners need hands-on engagement with real systems, applied projects, mentorship, and exposure to the environments in which AI, HPC, and quantum technologies are being developed and deployed. Experiential learning was therefore framed as essential to building a workforce capable of operating across disciplinary and technical boundaries.

Panelists also stressed that effective collaboration must be intentional, sustained, and aligned around shared incentives. Short-term or transactional relationships are insufficient to address the complexity of emerging technologies. Instead, successful partnerships require shared governance, long-term engagement, and a clear understanding of how each sector contributes to the broader ecosystem. The panel reinforced a core Summit message: advancing AI and quantum innovation will depend as much on collaboration, workforce development, and software-enabled usability as on the underlying technologies themselves.

Panel 2: Democratizing Access: National Resources and Regional Initiatives

Panel 2 examined how national platforms and regional ecosystems are expanding equitable access to the advanced infrastructure required for AI, quantum, data-intensive science, and next-generation research workflows. The discussion focused on how national investments can be translated into broad and meaningful participation across institutions, including those with fewer local resources. Panelists explored federated models, hybrid workflows, shared facilities, and collaborative frameworks that can help bridge the gap between national-scale infrastructure and institutional needs.

A central theme was that **availability does not equal usability**. Programs such as **NSF ACCESS** and the **NAIRR Pilot** have significantly expanded access to advanced computing, AI, and data resources. However, panelists emphasized that researchers often need more than an allocation or account credentials. They need guidance, onboarding, training, workflow support, and help identifying which resources are most appropriate for their research goals. This reinforced one of the Summit's recurring messages: access must be paired with enablement.

The NSF perspective highlighted a growing and evolving portfolio of initiatives designed to integrate compute, data, AI readiness, and workforce development. These programs reflect a shift toward more holistic approaches that address the full lifecycle of research, from access to cyberinfrastructure through user support, data systems, workforce preparation, and sustained research adoption. This broader framing recognizes that national investments achieve their greatest impact when they are embedded in support structures that help institutions and researchers use them effectively.

A key case study was the **University of Utah's AI Supercomputer initiative**, presented by **Bill Miller**, which offered a detailed example of a comprehensive regional model. The initiative integrates advanced GPU-based infrastructure, workforce development programs, and governance structures designed to align institutional needs across the state. A defining feature of the Utah model is its emphasis on enablement, including structured onboarding, training, and distributed "champions" who support users locally. This approach directly addresses the gap between access and adoption by creating trusted pathways for researchers, educators, and students to engage with advanced infrastructure.

Regional perspectives further emphasized the importance of shared facilities and emerging AI–quantum hubs in connecting national platforms with local implementation. These hubs can provide localized expertise, user support, training, and coordination, enabling a broader range of institutions to participate in advanced research and education. They also help translate national priorities into regional action by aligning infrastructure, workforce development, and institutional readiness.

Throughout the panel, facilitation emerged as a critical function. Panelists noted that researchers often require personalized, human-centered support to navigate complex systems, adapt workflows, and identify appropriate tools and resources. This need is especially important for smaller, under-resourced, or non-R1 institutions that may lack deep internal cyberinfrastructure teams. The panel reinforced that equitable access depends not only on national-scale platforms, but also on regional ecosystems, trusted facilitators, and support models that meet researchers and institutions where they are.

Panel 3: Research Data Management in the AI Era

Panel 3 focused on data as the foundation, and increasingly a key bottleneck, in AI-driven and advanced research. While compute capacity continues to expand through national and regional investments, panelists emphasized that progress related to data management is increasingly constrained by challenges related to data quality, fragmentation, interoperability, governance, metadata, compliance, and trust. The discussion made clear that advancing AI-enabled research will depend not only on greater compute resources, but on robust, trusted, secure, and well-governed data ecosystems.

Panelists identified several persistent barriers that limit the effective use of data across institutions and research communities. Data is often fragmented across systems, disciplines, and organizations, making it difficult to discover, access, combine, and reuse. Lack of standardization and interoperability further constrains collaboration, while inconsistent metadata practices can reduce transparency, reproducibility, and long-term value. These challenges become especially significant as AI workflows require large, well-curated, and trustworthy datasets.

The panel also examined the importance of secure data stewardship. Effective data ecosystems must support responsible sharing while protecting privacy, security, intellectual property, and institutional obligations. This requires alignment across technical systems, governance frameworks, compliance requirements, and organizational practices. Panelists emphasized that data sharing is not simply a technical problem; it is also a policy, legal, cultural, and trust-building challenge.

Federated data ecosystems were discussed as a promising approach for enabling distributed access while allowing institutions to maintain appropriate control over their data. Such models can help connect datasets across institutions without requiring all data to be centralized in a single location. However, participants noted that implementation remains complex and uneven. Federated models require common standards, strong metadata practices, secure access controls, clear governance agreements, and the technical expertise needed to operate across distributed environments. The panel noted that developing metadata standards and achieving consistency will be challenging. While valuable, it should not become the key focus or limit forward progress toward developing data management solutions.

Trust emerged as a central theme throughout the panel. Institutions and researchers must have confidence that data is authentic and will be used appropriately, secured effectively, and governed transparently. Building this trust requires more than technology. It depends on shared expectations, clear policies, accountability mechanisms, and sustained relationships among participating institutions. In many cases, the social and governance dimensions of data sharing may be more difficult to resolve than the technical ones.

The panel also emphasized inclusion as an essential design principle. AI-ready data ecosystems must be accessible to institutions with varying levels of capacity, including smaller and under-resourced institutions. These institutions should be able to participate not only as users of shared data resources, but also as contributors to broader research ecosystems. Achieving this will require support for data management competencies, training, consultation, and shared services that reduce barriers to participation.

Overall, Panel 3 reinforced that data is now a defining component of research cyberinfrastructure. Governance, metadata standards, compliance, secure stewardship, and interoperability are essential to reproducible and trustworthy research. As AI-driven discovery continues to expand, the demand for new data management competencies will grow. The ability to build trusted, federated, and inclusive data ecosystems will be central to realizing the full value of national investments in AI, advanced computing, and research infrastructure.

General Discussion and Closing Reflections

The open discussion session surfaced candid and practical insights from participants, highlighting the real-world challenges institutions and researchers face when adopting advanced cyberinfrastructure. While the Summit's keynote and panels addressed national strategies, emerging technologies, and ecosystem models, the open discussion brought the conversation back to implementation: what it actually takes for researchers, faculty, students, and institutions to use available resources effectively.

A strong theme was the importance of hands-on facilitation and personalized support. Participants emphasized that access to resources must be accompanied by practical guidance, including onboarding, training, workflow consultation, and help identifying the most appropriate infrastructure for a given research need. One participant described a hands-on approach to guiding researchers through the process of selecting and using resources, reinforcing the idea that many users need more than general documentation or self-service access. They need trusted facilitators who can help translate complex technical options into usable pathways for research.

The discussion also reinforced the continued importance of local infrastructure, even as national platforms such as NSF ACCESS, NAIRR, and other shared resources expand. Participants noted that local systems remain essential for training, experimentation, recruitment, student engagement, and institutional readiness. Local resources often provide the first point of contact for researchers and learners, allowing them to build confidence before engaging larger national-scale platforms. At the same time, participants raised concerns about sustainability, particularly as institutions face uncertainty around long-term funding and the ongoing costs of maintaining local systems. As one participant noted, "Universities and faculty still want to have local resources… however, sustainability is getting more and more difficult."

Data management and training were also identified as persistent challenges. Participants noted that even when computing resources are available, the lack of training, data support, metadata practices, and governance structures can prevent effective use. The discussion surfaced emerging ideas for addressing trust, transparency, and provenance in data ecosystems, including the possible use of blockchain for data indexing and provenance. While exploratory, these ideas reflected the community's ongoing interest in developing new approaches to secure, trusted, and transparent data sharing.

The open discussion also pointed to the potential role of AI-enabled tools in improving access and usability. Participants raised the possibility of AI-driven resource recommendation systems that could help researchers identify appropriate computing, data, software, or support resources based on their project needs. Such approaches could reduce barriers to entry, particularly for researchers who may not know where to begin or which platform best fits their workflow. These ideas reinforced the broader Summit theme that future infrastructure must be user-centered, responsive, and easier to navigate.

Taken together, the open discussion reinforced a central message of the Summit: infrastructure alone is not enough. Adoption depends on the integration of technology, workforce, training, local capacity, trusted data systems, and sustained support. Participants emphasized that the path forward must be grounded in practical enablement, with support models that meet users where they are and help institutions of varying capacity participate meaningfully.

The closing remarks, delivered by Forough Ghahramani, brought these themes together under the Summit's central framing: **"Beyond Resources."** She noted that the day began by acknowledging an extraordinary moment of national investment in AI, quantum, and advanced cyberinfrastructure from organizations such as the National Science Foundation and the U.S. Department of Energy. However, the discussions throughout the Summit made clear that building capacity is only the beginning.

Reflecting on the day's sessions, she emphasized that the first panel demonstrated the importance of collaboration across industry, academia, and national laboratories in moving from isolated innovation to integrated ecosystems. The second panel raised the essential question of who gets to participate, reminding participants that democratizing access is not only about connectivity, but also about enabling institutions to contribute, innovate, and lead. The third panel examined the role of data ecosystems and the importance of building systems that are not only technically advanced, but trusted, usable, and aligned across communities.

Across the Summit, one message stood out: the future of AI, quantum, and advanced technologies will not be defined by infrastructure alone. It will be defined by how well the ecosystem connects national and regional efforts, technology and people, and access and opportunity. This is a systems challenge, requiring new models of collaboration, roles that bridge technology and users, and a shared commitment to expanding participation across the research ecosystem.

The closing reflection returned to the question at the heart of the Summit: not simply what has been built, but what these investments will enable, and who will be empowered to shape the future. In this sense, the open discussion and closing remarks reinforced the Summit's overarching conclusion: the next phase of research cyberinfrastructure must be integrated, inclusive, user-centered, and sustained through collaboration across the full ecosystem.

5 FINDINGS and EMERGING THEMES

The ERN Summit 2026 surfaced a set of deeply interconnected themes that together define the current state and future direction of the research cyberinfrastructure ecosystem. These themes reflect a shift not only in technology, but also in how institutions, researchers, and communities engage with that technology. Across the keynote, panels, and community discussion, the Summit revealed a transition toward a more integrated, user-centered, and collaborative model of research infrastructure, one that prioritizes impact over access, enablement over availability, and coordination over isolation.

The major themes included the shift from access to enablement, the rise of ecosystem-based innovation, the integration of emerging technologies with existing systems, the central role of the workforce, the growing importance of data, the need for regional models, and the challenge of long-term sustainability. Together, these themes suggest that the next phase of the research ecosystem will be defined not simply by the availability of advanced tools and platforms, but by the ability of institutions and networks to help researchers use them effectively, equitably, and sustainably.

5.1 From Access to Enablement

Perhaps the most important insight emerging from the Summit was the distinction between providing access to resources and enabling their effective use. National initiatives such as NSF ACCESS and the NAIRR Pilot have made significant strides in expanding the availability of advanced computing, AI, and data resources. However, participants repeatedly emphasized that access alone does not translate into adoption or impact.

Researchers face real constraints, particularly around time, workflow disruption, and unfamiliarity with complex technical environments. Learning new systems, adapting research processes, and navigating resource options can impose significant burdens, especially for principal investigators managing multiple responsibilities. As one participant noted during the discussion, if researchers cannot quickly and effectively use the systems they are granted access to, they may disengage regardless of the potential value of those resources.

This reality elevates enablement to a central role in modern cyberinfrastructure. Effective models must include not only computing capacity and technical platforms, but also onboarding processes, training programs, consultation services, documentation, workflow support, and ongoing facilitation. The concept of "meeting users where they are" emerged as a guiding principle, emphasizing flexibility, accessibility, and responsiveness to users with varying levels of expertise.

In this context, roles such as Campus Champions, AI facilitators, research computing professionals, and regional support networks become critical. These individuals and networks serve as bridges between complex systems and the researchers who depend on them. The Summit made clear that enablement is not an auxiliary function; it is a core component of effective research infrastructure.

5.2 Ecosystems as the Unit of Innovation

A second major theme was the shift from institution-centered to ecosystem-centered models of innovation. The complexity of modern research challenges, and the technologies required to address them, increasingly demand collaboration across organizational, disciplinary, and sector boundaries. No single institution can independently provide the full range of infrastructure, expertise, data, software, training, and partnerships required to advance AI, quantum, and data-intensive research.

Examples presented during the Summit illustrated how effective ecosystems integrate multiple components, including research universities, industry partners, national laboratories, community colleges, regional research and education networks, government agencies, startups, and outreach organizations. These collaborations enable the sharing of resources, expertise, standards, training opportunities, and pathways into emerging technology fields. They also help align research with real-world applications and workforce needs.

The Quantum Photonics Integration and Deployment initiative provided one example of this model, bringing together universities, industry stakeholders, and outreach partners to support quantum research and workforce development. Similarly, the Quantum Scaling Alliance illustrated how cross-sector collaboration can help reduce fragmentation by developing shared frameworks, supporting coordination, and advancing practical pathways for scaling emerging technologies.

These models highlight the importance of intentional coordination. Ecosystems do not emerge automatically; they must be designed, convened, governed, and sustained. ERN's role as a convener positions it uniquely to support this process at both regional and national levels by connecting institutions, facilitating partnerships, and helping align infrastructure, expertise, and community needs.

5.3 Integration Over Replacement

The Summit also addressed the evolving relationship between emerging technologies and existing systems, particularly in the context of quantum computing. The keynote and subsequent discussions emphasized that the future of advanced computing will not be defined by the replacement of classical systems, but by their integration with new capabilities.

This integration is already taking shape in heterogeneous computing environments that combine CPUs, GPUs, quantum processing units, AI-enabled orchestration, and advanced networking. Rather than treating AI, HPC, quantum, and data systems as separate domains, the emerging model is increasingly workflow-centric. The goal is to support end-to-end research processes across multiple computational environments, rather than optimizing individual components in isolation.

From a strategic perspective, integration offers several advantages. It allows institutions to build on existing infrastructure, reducing costs and lowering barriers to adoption. It supports flexibility, enabling organizations to experiment with new technologies without committing prematurely to a single vendor, platform, or architecture. It also allows researchers to engage emerging capabilities incrementally, developing expertise and use cases over time.

The emphasis on horizontal integration, linking systems across layers, technologies, and domains, represents a pragmatic and scalable path forward. It aligns closely with the broader

Summit theme that future impact will depend on the ability to integrate advanced technologies into usable, accessible, and sustainable research workflows.

5.4 Workforce as Critical Infrastructure

Workforce challenges were consistently identified as a major barrier to progress. While significant attention has been devoted to building physical and technical infrastructure, the human infrastructure required to operate, maintain, support, and utilize these systems has not kept pace. Participants emphasized that workforce is not merely a supporting element of cyberinfrastructure; it is core infrastructure.

The Summit highlighted the growing importance of Research Software Engineers. These professionals play a central role in modern scientific discovery by developing, maintaining, optimizing, and scaling the software that underpins research workflows. They enable reproducibility, support complex computational methods, and bridge the gap between domain science and technical systems. Despite their critical contributions, Research Software Engineers often remain under-recognized within academic structures, with limited visibility, unclear career pathways, and insufficient institutional support.

The concept of "hidden contributors," illustrated through references to Katherine Johnson, Dorothy Vaughan, and Mary Jackson, provided a powerful framework for understanding this issue. Just as those individuals made essential contributions that were not fully acknowledged at the time, today's Research Software Engineers and related technical professionals represent a foundational but often invisible component of the research ecosystem.

This workforce challenge extends beyond Research Software Engineers. There is growing demand for data engineers, AI facilitators, research computing professionals, cyberinfrastructure specialists, and cross-disciplinary staff who can operate at the intersection of science, computing, data, and institutional strategy. Addressing this gap will require increased investment in training, experiential learning, mentorship, professional communities, and career pathways. It will also require institutions to recognize these roles as essential to the research mission.

5.5 Data as the Primary Bottleneck

While advances in computing have expanded the capacity for data-driven research, the Summit made clear that data itself has become a limiting factor. Challenges related to data management, sharing, interoperability, metadata, governance, and trust are increasingly constraining the effectiveness of AI and other advanced technologies.

Participants identified several persistent issues, including fragmentation of data sources across institutions and systems, lack of standardization, inconsistent metadata practices, and barriers to secure and trusted data sharing. These issues limit the ability of researchers to discover, combine, reuse, and analyze data effectively. As AI-driven research expands, the quality, accessibility, governance, and interoperability of data become just as important as compute capacity.

Federated data models were discussed as promising approaches for enabling distributed access while allowing institutions to maintain appropriate control over their data. However, participants noted that implementation remains complex and uneven. Federated systems require not only technical infrastructure, but also shared standards, governance agreements, metadata practices, security frameworks, and trusted relationships among participating institutions.

Trust emerged as a particularly important dimension. Data sharing is not solely a technical challenge; it also involves policy, governance, compliance, ethics, security, privacy, and culture. Building systems that are both secure and accessible requires careful alignment across these domains. Without robust and interoperable data ecosystems, even the most advanced computing resources cannot achieve their intended impact.

5.6 The Role of Regional Models

The Summit reinforced the importance of regional initiatives as a complement to national programs. While platforms such as NAIRR and NSF ACCESS provide critical resources, they must be paired with localized efforts that address the specific needs, constraints, and readiness levels of individual institutions.

The University of Utah's AI Supercomputer initiative provided a compelling example of this approach. By coordinating across the state's higher education system, the initiative creates a shared resource that supports a wide range of users, including researchers, educators, and students. Its success is driven not only by advanced GPU-based infrastructure, but also by a comprehensive enablement model that includes onboarding, training, governance structures, and distributed champions who support users locally.

Regional models play a crucial role in bridging the gap between national infrastructure and local implementation. They can provide trusted points of entry, localized support, shared expertise, and coordination across institutions with varying levels of capacity. This is especially important for smaller, under-resourced, and non-R1 institutions that may not have extensive internal cyberinfrastructure teams.

By aligning national platforms with regional support structures, these models enable more equitable participation. They help ensure that access to advanced resources is not limited to institutions that already have deep technical capacity, but can extend to a broader and more diverse research and education community.

5.7 Sustainability and Long-Term Investment

Finally, the Summit highlighted ongoing concerns related to sustainability. Many institutions rely heavily on grant-funded programs such as NSF CC* and MRI to build, expand, and maintain cyberinfrastructure. While these programs have been highly effective in catalyzing progress, questions remain about long-term availability, operational sustainability, staffing, refresh cycles, and the ability of institutions to sustain capabilities once initial funding ends.

Participants emphasized the need for funding models that combine federal support with institutional investment, regional coordination, and private-sector partnerships. Sustainability cannot depend solely on one-time infrastructure acquisition. It must include ongoing support for operations, workforce, training, software maintenance, governance, security, and user engagement.

Developing sustainable approaches will be essential for ensuring that progress achieved through current initiatives can be maintained and expanded over time. This is particularly important as AI, quantum, and data-intensive research continue to evolve rapidly, requiring continuous adaptation rather than static infrastructure investments.

Taken together, the Summit's emerging themes point toward a clear conclusion: the future of research cyberinfrastructure will depend on integrated systems of technology, people, data, governance, and partnerships. The next stage of progress will be measured not only by what resources are available, but by how effectively the ecosystem enables researchers and institutions to use them to advance discovery, education, and innovation.

6 RECOMMENDATIONS

The ERN Summit 2026 underscored that the next phase of research cyberinfrastructure will require coordinated action across the full ecosystem. Expanding access to advanced computing, AI, quantum, and data resources remains important, but the greater opportunity now lies in enabling effective use, strengthening the workforce, improving data readiness, and building sustainable partnerships. The following recommendations are organized by stakeholder group and reflect the Summit's central message: long-term impact will depend on aligning infrastructure, people, workflows, governance, and collaboration.

For the ERN Community

- **Expand enablement and facilitation models**
  ERN could continue advancing models that help researchers and institutions move from access to effective use.
- **Strengthen cross-sector partnerships**
  ERN could deepen collaboration across academia, industry, national laboratories, regional networks, and community partners. These partnerships can accelerate

innovation, reduce fragmentation, and create more meaningful pathways for workforce development and applied research.

- **Continue convening and knowledge sharing**
  ERN's role as a neutral convener remains essential to the ecosystem. Continued summits, working groups, webinars, and community discussions can help surface shared challenges, disseminate promising practices, and align regional and national efforts.

For Funding Agencies (e.g., NSF, DOE)

- **Invest in workforce development alongside infrastructure**
  Funding programs could support the people required to operate, sustain, and translate infrastructure into research impact. This includes support for Research Software Engineers, data professionals, AI facilitators, cyberinfrastructure specialists, training programs, and experiential learning models.
- **Support regional and ecosystem-based models**
  National investments could be paired with regional structures that provide localized support, coordination, and user engagement. Regional ecosystems can help bridge national platforms and institutional needs, particularly for smaller, under-resourced, and non-R1 institutions.
- **Develop sustainable funding approaches.**
  Funding agencies could explore models that move beyond one-time infrastructure acquisition. Long-term support is needed for operations, staffing, software maintenance, governance, training, and user support to ensure that investments remain usable and impactful over time.

For Academic Institutions

- **Invest in RSEs and data professionals**
  Institutions could recognize Research Software Engineers, data engineers, data stewards, and related professionals as essential contributors to the research enterprise. Clear career pathways, stable funding models, and institutional recognition are needed to recruit, retain, and support this talent.
- **Align infrastructure with research workflows**
  Institutions could design and deploy infrastructure around the actual needs of researchers, educators, and students. This requires engaging users early, understanding disciplinary workflows, and ensuring that support services are available to help researchers adopt and integrate advanced tools.
- **Engage in regional collaborations**
  Academic institutions could actively participate in regional networks, shared infrastructure initiatives, and cross-institutional partnerships. These collaborations can

expand access to expertise, reduce duplication, and help institutions contribute to broader research and workforce ecosystems.

For Regional Stakeholders and State Governments

- **Support statewide and regional infrastructure initiatives**
  Regional stakeholders and state governments could play an important role in building shared infrastructure that serves multiple institutions. These investments can help create more equitable access to advanced computing, AI, quantum, and data resources across a state or region.
- **Invest in workforce pipelines**
  States and regional partners could support education and training pathways that prepare students, researchers, and technical professionals for emerging roles in AI, quantum, data science, research computing, and cyberinfrastructure. Workforce pipelines should include experiential learning, internships, apprenticeships, and partnerships with employers.
- **Foster industry-academic partnerships**
  Regional leaders could encourage sustained partnerships between higher education, industry, startups, and public-sector organizations. These partnerships can align research, training, and innovation with regional economic priorities while creating practical opportunities for students and researchers.

7 ACKNOWLEDGEMENT

Special acknowledgement to the ERN Working Group Members for program development and execution, the ERN Steering Committee for guidance and support, and the Pittsburgh Supercomputing Center and Carnegie Mellon University staff for assistance for event management support.

8 APPENDICES

8.1 ERN Working Group Overviews

8.1.1 Materials Discovery Working Group

Materials Discovery is one of the research areas where gaining a deeper understanding of the workflows, research computing and data requirements, collaborations, and challenges will enable the ERN to have the broadest impact across multiple research disciplines, pedagogical approaches, senior level college and university administrators, and other organizations within the region and beyond. Researchers in materials discovery are realizing that their traditional data-intensive HPC workflows are reaching the limits of spatial and temporal scales required to make deeper insights and predictions. For this reason, they are looking to new paradigms that include convergence of HPC and Machine Learning (ML) methodologies, algorithm development, and novel ways to access the data distributed across multiple institutions used in training systems as promising approaches to overcome the major computational performance limitations. As a science design driver, the ERN materials discovery working group will work with OpenCI Labs to develop an instrument abstraction layer for four widely used instruments within the materials discovery community. By offering federated access to these instruments through OpenCI Labs, we anticipate usage from a broader research and education community as well as lay the groundwork for a national materials database for the materials discovery community, similar to the PDB for the structural biology community.

ERN Materials Discovery Data Driven Vision:

- Develop materials-centric structured databases that can be accessed through a secure interface from all member institutions - organization, architecture, HPC, storage, etc.
- Develop materials data-sharing policies and language for umbrella institution agreements - IP, Publication, Thesis, etc.
- Involve shared facilities at each institution to participate in development of structured databases. Software and hardware updates needed to make this process as automated as possible.
- Develop web-based training protocols for young researchers at partnering institutions to access and utilize the database.

Program Tasks:

- Data Sharing Protocols - data differs for each instrumentation.
    - Form a Materials Data Sharing Policy team, lead by shared facilities, that develops the data organization and sharing standards for each type of characterization technique
- User interfaces required to upload data from commonly used software on large instrumentations o cloud-based structured database
- Develop network of users across participating institutions
- Enhancement in the computational science - modeling and simulations facilitated through the experimental data and HPCs
- Broader impact activities - connection to colleges and MSIs

The goal of our remote instrumentation program would be over the course of three/four years, many of these machines, initially Scanning Electron Microscopy (SEM)and diffraction, would be available on-line for all the world to utilize. Data collected and compiled would be placed into the database developed through this program and launch the next generation of materials science from this.

8.1.2 Structural Biology Working Group

Structural biologists are now generating huge datasets as they develop new tools and instruments to gain better understanding of the molecular structure of biological macromolecules and how these structures are formed or affected if altered. For this reason, biologists are faced with having to overcome many challenges that occur when developing research workflows that couple their instruments with research computing and machine learning. An added challenge occurs when collaborating with researchers outside of their respective organizations. Firewalls, bandwidth, and campus authentication services are just a few of the roadblocks they typically encounter. As an example, Cryo-electron Microscopy (Cryo-EM), and more recently Electron Cryotomography (Cryo-ET), have revolutionized structural biology through advances in microscope optics and detectors, but rely heavily on image processing pipelines that are both compute and data intensive. Exploratory conversations with structural biology leadership at Rutgers, Yale, the University of Massachusetts, Penn State, and others suggest that a stronger partnership between providers of structural biology and research computing services can both improve the efficiency with which well-resourced labs can obtain scientific results, and make these resources and techniques more readily available to underserved institutions that have fewer resources and less access to technical expertise. As a science design driver, the ERN structural biology working group will work closely with the OpenCI Labs development teams to ensure that the system software, instrument abstraction layers, user interfaces, workflow designs, and containerized data focused micro-services meet the needs of the structural biology community, especially those using CryoEM/ET instrumentation.

8.1.3 Architecture and Federation Working Group

The vision of the federated collaboratories requires the development of many layers of abstractions ranging from hardware, networking, federation architecture, scientific workflows, and domain-specific models and tools to enable collaborative discovery. The ERN Architecture and Federation working group concentrates on gathering information and developing what the “federated collaboratory” might look like from both a hardware and software perspective, and what federation should look like as ERN strives for a seamless collaborative sharing experience.

These developing solutions focused on supporting the vision and mission of the ERN, many of the challenges the ERN will face will lead to questions that ultimately become interesting Computer Science (CS) research projects on topics such as ontologies and knowledge representation, workflow analysis, federated AI/ML, domain-specific programming languages, to architecture, networks, systems, and security. The ERN will also provide a testbed for CS experiments (Measurement Monitoring, Self-Optimizing Systems) and will leverage existing NSF funded projects (FABRIC, Open Cloud, CC*) leading the way to become an instrument to connect other research instruments or platforms.

8.1.4 Policy Working Group

The vision of the ERN is to simplify multi-campus collaborations and partnerships that advance the frontiers of research and innovation. In order to do this successfully the ERN needs to consider current university policies as well as engage with university administrations (VPRs, CIOs, General Counsel, and IRB directors) in developing a policy strategy to help us bring the vision to reality. Community topics of concern include university policies and what considerations need to be taken into account as we create new policies and procedures for the ERN as a whole and its participants; what needs to be in place that allows ease of sharing knowledge, data, infrastructure, and people; compliance requirements and security concerns; and sustainability. The Policy Working Group has worked toward these goals focused on CI sharing policies, organizational aspects, and anticipation of possible collision between local policy and overall policy.

8.1.5 Broadening the Reach Working Group

Many non-R1 institutions, including smaller, mid-sized campuses, including MSIs, HSIs, HBCUs and EPSCoR institutions have compelling science research and education activities along with an awareness of the benefits associated with better access to cyberinfrastructure resources. These schools can benefit greatly from resources and expertise to augment their in-house efforts. This could include identifying, understanding, and quantifying the science drivers; understanding the cyberinfrastructure needed to support the applications; and provide both the technical and application support associated with matching the applications to the infrastructure, particularly when the required resources are outside of their campus environment. The ERN Broadening the Reach working group is focused on learning directly from this community on how best to support the needs of the academic institutions, which happens to be most of the academic institutions across the US. Because of the trusted relationship between smaller academic institutions and the regional network providers, the role of regionals as facilitator and user support for these smaller institutions within the ERN will be explored
.

Goals:

- Focus on engaging/supporting non-R1 institutions, including small to medium campuses: MSIs, HSIs, HBCUs, EPSCoR
- Identify compelling science research and education and outreach activities
- Explore the role of regionals as facilitator and user support for these smaller institutions within the ERN
- Identify potential collaboration opportunities for proposals
- Building & leveraging a highly skilled, diverse workforce to support emerging and advanced technologies

8.1.5.1 Quantum Education Alliance

The Quantum Education Alliance was launched as a direct outcome of the ERN Summit 2025, reflecting a collective response to the opportunities and challenges identified by the research community. Emerging from the partnerships and dialogue fostered during the Summit, the Alliance brings together academic institutions, research organizations, national laboratories, nonprofits, and industry partners to expand access to quantum education and broaden participation in the field. As a subcommittee of the Broadening the Reach Working Group, it is grounded in a commitment to strengthening multi-institutional collaboration, particularly by elevating the role of non-R1 institutions in driving innovation.

At the heart of the Alliance is a mission to democratize access to quantum education and career pathways across the research ecosystem. Its goal is to cultivate a cohesive, inclusive quantum talent workforce by connecting national and regional initiatives with industry partners and educational institutions. It emphasizes fostering collaborative efforts, sharing knowledge and expertise, and aligning national strategies with regional strengths and community needs. By leveraging and aligning existing programs, the Alliance seeks to reduce barriers to entry, expand participation, and create clearer, more accessible pathways for learners at all stages. Through shared curricula, hands-on experiences, and coordinated programming, the Alliance works to create a more inclusive and interconnected quantum education landscape.

A key example of this collaborative model is the Quantum Webinar Series, developed in partnership with ERN and the Northeast Big Data Innovation Hub (NEBDHub). By convening researchers, educators, and industry leaders, the series highlights how the Alliance fosters knowledge-sharing, cross-sector engagement, and broad access to quantum learning. Through initiatives like this, the Alliance demonstrates how leveraging existing efforts can accelerate impact while building a more connected and inclusive quantum future.

8.2 SUMMIT Program Details

8.2.1 Presentation Materials

The workshop event website for registration and participant information was hosted by ERN through the ERN website (https://www.ernrp.ci/) and located here: https://ern.ci/ern-summit-2026/. Presentations made available by the panelists are available here, in addition to the Keynote speaker and panelists biographies.

8.2.2 Program Agenda

Ecosystem for Research Networking(ERN) Summit 2026 Agenda

Beyond Resources: Integrating AI, Quantum, and the Workforce of the Future

Wednesday, April 22, 2026 - 12:00 PM - 5:00 PM ET - Virtual Event

The Ecosystem for Research Networking (ERN) Summit welcomes the scientific and cyberinfrastructure research community to gather together with industry, domain researchers, cyberinfrastructure professionals, and federal government agency representatives to share information, insights and experiences regarding the impacts that advanced technologies, Quantum and AI, and workforce development are having on scientific advancement.

12:00 - 12: 15 Welcome and Opening Remarks

Summit 26 Co-Chairs

Forough Ghahramani, Ed.D., Vice President for Research & Innovation, NJEdge

Maureen Dougherty, Ecosystem for Research Networking

Barr von Oehsen, Ph.D., Executive Director Pittsburgh Supercomputing Center

12:15 - 1:15 Keynote Speaker

Masoud Mohseni, Ph.D., Senior Distinguished Technologist, Director of HPE Quantum, Hewlett Packard Labs

"**Heterogeneous Quantum–Classical Computing: Scaling Through Integration**"

1:15 - 2:15 Panel 1: Building Sustainable Advanced Technologies: Industry, Academic, and National Lab Collaborations

Explore how industry, universities, national labs, and startups are partnering to accelerate AI and quantum innovation while building experiential workforce pathways.

Moderator/Panelist: **Sandra Gesing**, Ph.D., Executive Director, US-RSE, Senior Researcher at San Diego Supercomputing Center, UCSD

- AI Sandbox/Playground with Jetstream2

Panelists:

- **Benjamin (Ben) Brown**, Ph.D., Director, Facilities Division (Research Computing, Network, & Data Infrastructure), Advanced Scientific Computing Research, The U.S. Department of Energy *[invited]*
  - Department of Energy (DOE) Genesis Mission
- **Monica Van Dieren**, Ph.D., Sr. Technical Marketing Engineer, Quantum and HPC, NVIDIA
- **Parag Deotore**,Ph.D., Chen-Luan Family Faculty Development Professor of Electrical and Computer Engineering, Associate Professor, Applied Physics, University of Michigan

2:15 - 3:15 Panel 2: Democratizing Access: National Resources and Regional Initiatives

The panel examines national platforms and regional ecosystems that are expanding equitable access to the advanced infrastructure required by advanced technologies. Panelists will discuss federated models, hybrid workflows, and collaborative frameworks that enable broader participation in research and education.

Moderator/Panelist: **Barr von Oehsen**, Ph.D., Executive Director, Pittsburgh Supercomputing Center

Panelists:

- **Stephen Deems**, Director of Research Infrastructure Operations, Internet2, Internet2
- **Amy Apon**, Ph.D., Office of Advanced Cyberinfrastructure, Program Director, National Science Foundation
- **William L. Miller**, Ph.D., Senior Director for Research Computing and Data, Scientific Computing and Imaging (SCI), Institute & Center for High Performance Computing (CHPC), University of Utah

3:15 - 4:15 Panel 3: Research Data Management in the AI Era

The panel will discuss how governance, metadata standards, compliance, and secure data stewardship underpin reproducible advanced research and drive demand for new data management competencies.

Moderator: **Jim Griffioen**, Ph.D., Professor of Computer science, The Pigman College of Engineering, Director, Center for Computational Sciences, University of Kentucky

Panelists:

- **Chris Simmons**, Ph.D., Scientist in Residence, Cambridge Computer
- **Miron Livny**, Ph.D., Professor of Computer Science, Chief Technology Officer and Principal Scientist at Core Computational Technology of the Wisconsin Institutes for Discovery, Director of the UW Center for High Throughput Computing (CHTC) and the Software Assurance Marketplace, the Technical Director of the Open Science Grid (OSG), University of Wisconsin-Madison
- **Ilkay Altinas**, Ph.D., Chief Data Science Officer, San Diego Supercomputer Center, UC San Diego

4:15 - 4:45 Open Discussion and Collaboration

4:45 - 5:00 Closing Remarks

8.2.3 Summit Registrants/Participants

8.2.3.1 Registration Statistics

ERN Summit 2026 Statistics	
Registrants	223
Attendees	98
Institutions/Affiliations	159

Institution Breakdown	
R1	71
Non-R1	38
Foreign Institutions	10
NREN/RENs	7
National Center/Resources	7
Consortiums	5
Industry	5
Consultants	4
Library/Digital Archives	4
Healthcare/Medical	3
Funding Agencies	2
Financial Institutions	2
Foundations	1

8.2.3.2 Registrant Affiliation

Affiliation
Alabama State University
Amherst College
Arizona State University
Attain Partners
Auburn University
Baylor University
Big Ten Academic Alliance
Binghamton University
Brigham Young University-Hawaii
Butler University

Butler University
California Digital Library
California State University, Fresno
California State University, Sacramento
California State University, Sacramento
Campostella Research and Consulting
Carleton College
Case Western Reserve University
Caterpillar
Central University of Rajasthan
Claremont McKenna College
Clemson University
Coalition for Academic Scientific Computation
Coalition for Networked Information
Colgate University
College of St. Benedict and St. John's University
Columbia University
Corning Inc
Corporation for Education Network Initiatives in California
Data & Society
Delaware State University
DePaul University
Des Moines University
Eastern Regional Network/Ecosystem for Research Networking
Emory University
Federal Reserve Bank of Cleveland
Franklin and Marshall College
George Mason University
George Washington University
Georgetown University
Government of Alberta
Great Plains Network
Hamilton College
Harvard University
Imperial College London/UK

Indiana University
Inter American Development Bank
Internet2
Johns Hopkins University
Kenyon College
KeystoneREN
LabArchives
Lafayette College
Langston University
Lawrence Berkeley National Lab
Library of Congress
Link Oregon
Louisiana State University
Loyola University Chicago
Lyrasis
Macalester College
Meharry School of Applied Computational Sciences
Middle Tennessee State University
Mississippi State University
Missouri University
Montana State University
National Center for Atmospheric Research
National Center for Supercomputing Applications
National Institute of Standards and Technology
National Science Foundation
Nemours Children's Health
New Jersey Institute of Technology
New York Structural Biology Center
Nirma University
NJEdge
Nokia
North Carolina State University
North Carolina State University
North Dakota State University
Nua Index Agency

NYSERNet
NYU Grossman School of Medicine
Ohio State University
Ohio Supercomputer Center
Penn State College of Medicine
Pennsylvania State University
PIER Group
Pittsburgh Supercomputing Center
Princeton University
Purdue University
Quantum Foundry
Queen’s University
Reed College
Rensselaer Polytechnic Institute
Research Advisors Group
Rice University
Rowan University
Rutgers University
San Diego Supercomputing Center
Stanford University
Stony Brook University
Surge Arkansas
Swarthmore College
Texas A&M, San Antonio
Texas State University
Texas Tech University
The J. Paul Getty Trust (Getty)
Trinity College
United States Naval Academy
University at Buffalo
University of South Carolina
University of Arkansas
University of Arkansas
University of British Columbia
University of California, Berkeley

University of California, Riverside
University of Cincinnati
University of Delaware
University of Delaware
University of Georgia
University of Hawaii
University of Houston
University of Illinois Urbana-Champaign
University of Kentucky
University of Massachusetts Amherst
University of Michigan
University of Michigan
University of Minnesota
University of Missouri
University of Missouri
University of Missouri, Columbia
University of Nevada Reno
University of New Mexico
University of Northern Iowa
University of Pennsylvania
University of Pittsburgh
University of South Florida
University of Tennessee
University of Tennessee
University of Tennessee, Knoxville
University of Texas at Austin
University Of Texas, San Antonio
University of Toronto Libraries
University of Utah
University of Vermont
University of Virginia
University of Windsor
University of Wisconsin Madison
Virginia Commonwealth University
Washington and Lee University

Washington University in St. Louis
Wayne State University
West Virginia State University
Western Governors University
Western University
Wichita State University
Wilmington University
Yale University
York University

Roles
Academic Technologist
Administrative Assistant
AI Solutions
Applications Scientist
Architect
Assistant Director
Assistant Director of Libraries Technology
Assistant Director, Research and Data Services
Assistant Professor
Assistant Research Professor
Assistant University Librarian
Assoc. Director for Engagement
Assoc. Director of Research and HPC
Associate CIO, Advanced Research Computing
Associate Dean
Associate Dean of Libraries for Research
Associate Director
Associate Director of Academic Technology Services
Associate Director, University of California Curation Center.
Associate Library Director for Resource Management

Associate Professor
Associate University Librarian
Associate Vice President - Research Technology
Associate Vice President, Office of IT (Research Computing)
Bioinformatics Scientist
Business Process Consultant
Business Technology Analyst
Center for Research Computing and Data
Chief Information Officer
Chief Relationship Officer
Chief Technology Officer, Libraries and Museums
Client Engagement Manager
Co Founder
Co-Director, Center for Research Computing and Data
Co-Director, HPC
Co-PI
Communications
Computational Data Scientist
Computational Fellow
Computational Research Scientist
Controlled Research Program Manager
Core Manager, DNA and Data Science Core
Cyberinfrastructure Engineer
Cyberinfrastructure technologist
Data Curation Librarian
Database Administrator
Dean of Basic and Applied Sciences
Dean of Libraries
Department head
Deputy CIO
Digital Services
Director
Director IT - Research

Director of Digital Initiatives
Director of Instructional Technology Services
Director of Libraries
Director of Research & Strategy
Director of Research and Technology
Director of Research Data Stewardship
Director REN Engagement
Director, Academic Technology
Director, Center for Computational Sciences
Director, Data and Computing Sciences
Director, NYU Meta-Research Collaborative
Director, Research Computing and Data, Large Research Initiatives
Director, Research Data Services
Director, Research Technologies
Director, Research Technology Services
Director, Scientific Applications
Director of Technology
Director, Digital Imaging
Engineering Manager
Enterprise Success Manager
Executive Assistant to the Dean of Libraries
Executive Director
Executive Director for Research Engagement
Executive Director, Northeast Big Data Innovation Hub
Faculty
Features writer/communications
Founder, Digital Asset Management
Full-time Staff, Adjunct Faculty
GIS Librarian
Graduate Fellow
Graduate Research Assistant
Graduate Student
Head of Digital Learning & Scholarship

Healthcare Operational Performance Improvement and Data Analytics Manager
HPC Administrator
HPC Consultant
HPC IT Architect
HPC IT Manager
HPC Support Specialist
HPC SysAdmin and Research Assistant professor
HPC System Administrator
Independent AI/HCI Researcher
Information Officer
Information Systems Analyst and Domain Consultant
Infrastructure Architect
Interim Associate Director for Digital Strategy
Interim Director of Security & Compliance
Interim Director, Research Facilitation Service
IT Architect
IT Coordinator for Quantum Computing
IT Manager
IT Security Lead
IT Systems Analyst
Lead Strategist
Lead Systems Administrator
Librarian
Library Administrator
Library and Knowledge Specialist
Library Director
Manager, High Performance Computing
Manger of HPC User Services
Materials Engineer
Network Engineer
Phd student/research specialist
President
Presidential Fellow

Principal
Professor
Professor Emeritus
Program Coordinator
Program Director
Project Director
Project Manager
Research Administrator
Research and Education Librarian
Research Computing Facilitator
Research Computing Intern
Research Computing Manager
Research Computing Software Engineer
Research Computing System Admin
Research Data Librarian
Research Data Management Librarian
Research Data Manager
Research Engineer
Research Facilitator
Research Faculty
Research Scientist
Research Software Engineer
Research Support & Data Services Librarian
Research Support Engineer
Research Technology Consultant
Researcher
Scientific Application Consultant
Scientific Computing Consultant
Scientific Consultant
Senior Academic Technology Specialist
Senior AI Research Computing Engineer
Senior Architect
Senior Assistant Dean for Collections and Technology

Senior Associate
Senior Associate Dean, Head of Library Systems
Senior Associate Dean, Research Computing
Senior Director
Senior IT Manager - IT Research Support Solutions
Senior Librarian and OCUL AI Program Director
Senior Manager, Research Computing Services
Senior Research Computing Analyst
Senior Research Computing Facilitator
Senior Research Consultant, retired
Senior Researcher
Senior Scientific Advisor
Senior Scientist
Senior Systems Analyst
Senior Technology Integration Specialist
Senior Vice President
Storage Administrator - Research Support Solutions
Student
Systems Administrator
Teaching Assistant
Vice Chancellor and CIO
Vice President & CIO
Vice President for Libraries
Vice President for Research and Innovation
Vice President of Marketing Innovation
Vice President of Technology
Vice Provost & University Librarian

States Represented: 42
AL
AR

AZ
CA
CO
CT
DC
DE
FL
GA
HI
IA
IL
IN
KS
KY
LA
MA
MD
MI
MN
MO
MS
MT
NC
ND
NJ
NM
NV
NY
OH
OK
OR
PA
SC
TN
TX

UT
VA
VT
WI
WV

Countries
United States
Canada
India

8.3 ERN Steering Committee Members:

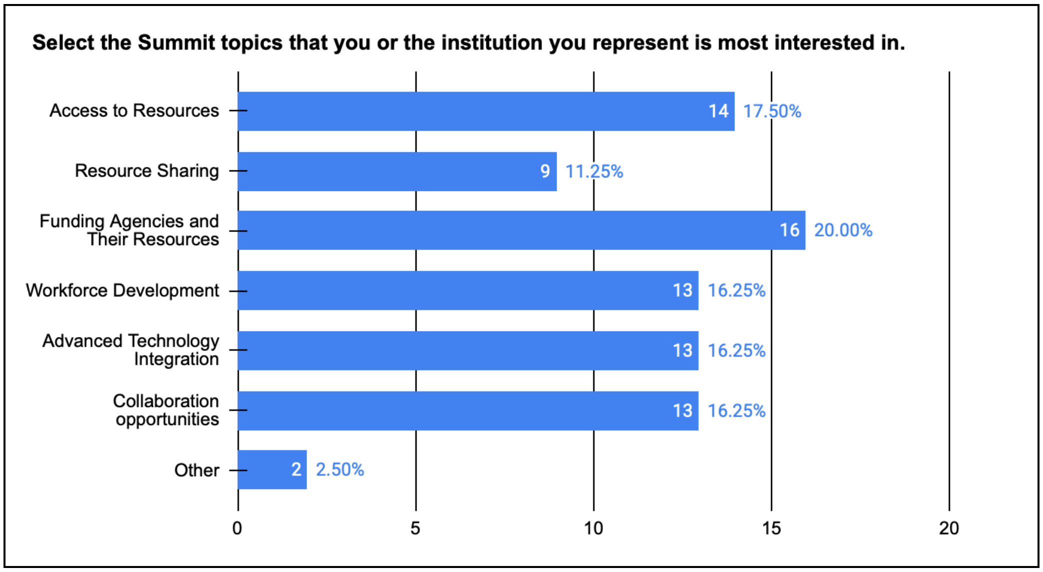
Maureen Dougherty, Ecosystem for Research Networking
Forough Ghahramani, Edge
John Goodhue, MGHPCC
Jim Griffioen, University of Kentucky
Vasant Honavar, Pennsylvania State University
Florence Hudson, Northeast Big Data Innovation Hub
David Marble, OSHEAN
Carrie Rampp, Franklin & Marshall College
Barr von Oehsen, Pittsburgh Supercomputing Center
Yifeng Zhu, University of Maine

8.4 Post-Summit Survey Results

This section highlights the results of the post-summit survey. 21 respondents, 21.43% of Summit participants completed the survey.

Question 1: Select the Summit topics that you or the institution you represent is most interested in.

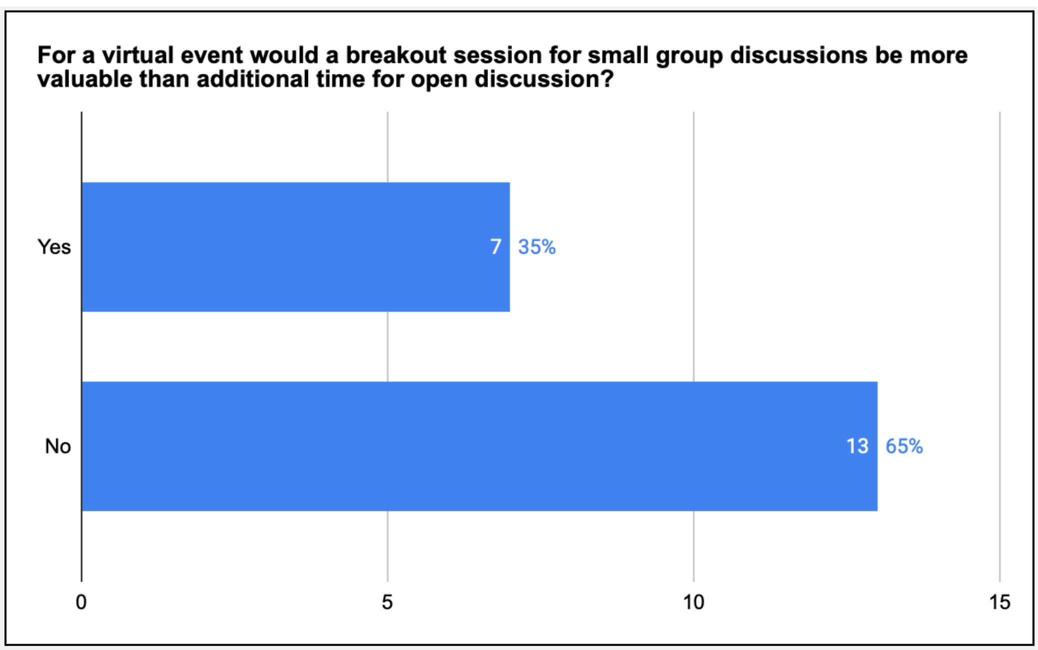
20 multi selection responses



Other: no response recorded

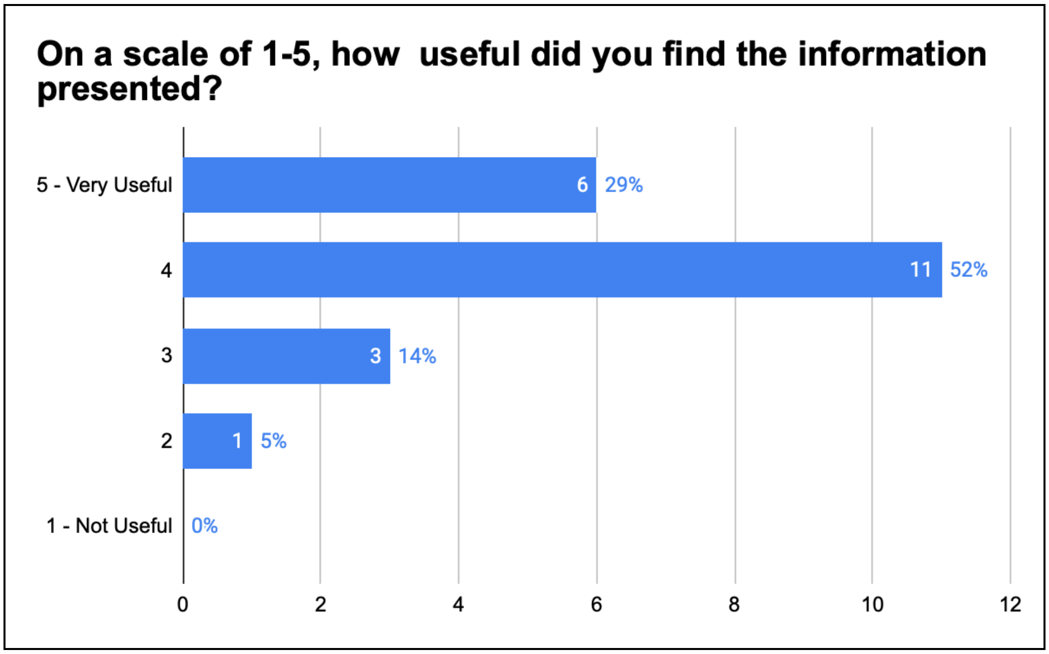
Question 2: For a virtual event would a breakout session for small group discussions be more valuable than additional time for open discussion?

20 responses



Question 3: On a scale of 1-5, how useful did you find the information presented?

21 responses



Question 4: What are the primary reasons for your rating?

15 responses

What are the primary reasons for your rating?
The quantum discussions and keynote were very informative.
All my interests are covered.
The presentations were timely and the presenters were specific in their delivery, while allowing open communication and thoughtful exchange.
Speakers and topics
I did not understand it all but would like to, some access to the recordings would help.
It gave me a lot of topics to learn more about and some information I can share in my organization. We're not an R1 so finding ways to expand access sustainably via NSF programs, partners, state networks is all really useful.
I felt that important topics were covered, including funding opportunities for specific things/ideas. The conversations were thought-provoking about how universities might be affected by AI and QC technologies, and how these technologies might shape some of what we do.
It has given me awareness of resources available, and what professionals at this scale think of.
Generally helpful
I found it useful, but some of it was also information I simply did not understand (yet).
Fairly useful but could be wider and more interdisciplinary

I learned a fair amount. Well done.
Preparations made for effective online experience.
I appreciated the speaker mix of academia/research, industry and NSF. Presentations and Q&A were thought provoking and indicate we are not the only group with questions but not enough answers.
The events I was able to sit in on were more experiences and questions that raised more questions. Great discussions, but in actionable items or hard-take backs there was little of.

Question 5: What do you think is the most important piece of information that the funding agencies should take away from the Summit, and how this would impact you and/or your constituents?

12 responses

What do you think is the most important piece of information that the funding agencies should take away from the Summit, and how this would impact you and/or your constituents?
The thirst for more funding opportunities.
Without human (facilitator) in the loop, access to computing power doesn't really deliver the results they expect, the ROI is not as high as it can be.
This subject matter is very timely and this discussion is critical so there can be sufficient input to the development and use of HPC and QPC.
Funding allocated for research facilitation
If Quantum Computing is inevitable then it must be in the budget.
There's a gap in experience and understanding how to apply for / get funding for a non-R1 I think, which may explain some of the "state network" success.
People bridging gaps across universities and beyond; regionally.
ERN's long-term capacity-building efforts have had an enormous impact on many segments of the higher education community and stand as a model for how this can be accomplished in the current crisis
The innovation that happens in higher education in HPC research, consortia, collaborations fuels innovation in other sectors because what our faculty can achieve, they will share with students - and these students will be employees or employers after graduation, continuing what they have experienced through these research opportunities.
More opportunities for small research grants.
Without the appropriately trained/skilled workforce, integration, implementation and utilization will fall short, reducing ROI of major, national programs and research.

There is still a lot of confusion about security and compliance.

Question 6: What was the most important piece of information that you took away from the Summit, and how may this impact you and/or your constituents?

15 responses

What was the most important piece of information that you took away from the Summit, and how may this impact you and/or your constituents?
The future of quantum which could impact our infrastructure and workforce development strategies.
New NSF supported infrastructure for data repository and future funding opportunities
The resources named allowing for future exploration and use.
Alignment of regional initiatives and national infrastructure. The important role of academic institutions (especially the R1s), government, RENs, and regional hubs in the collaboration.
Links to training resources that I could share with my team - any chance to get the slide decks? Call me boomer, but having the QR code instead of a link made this harder, could easily do both.
The state of quantum research and that what's appropriate for my organization is probably quantum toolkits like cuda-q
FAIR principal funding opportunities.
There are a number of factors, practical and social, that make it challenging for researchers to accept new technology or procedure. There are ways to help with that transition---incentives, small victory turnarounds, etc. How this may impact me: awareness as I enter the research facilitation field for full time profession (I am at intern level).
Lots of great things are being accomplished.
access to resources, esp for Quantum computing, that my constituents can try out.
Wider groups of university departments, schools and institutes should be account as our unit is tasks with educating and providing emerging technology onramps for researchers who may be outside of narrow traditional disciplines involved in these areas (i.e Computer Science Engineering)
Being exposed to the ongoing research.
There are resources that we could be taking better advantage of, and become active with to gain an edge for our group in integrating AI and Quantum into their research.
Quantum Computing is growing fast

That other institutions/labs are struggling with the same questions I see at ours.

Question 7: Please identify what other aspects of the Summit were most valuable to you and why.

12 responses

Please identify what other aspects of the Summit were most valuable to you and why.
The ability to ask questions.
The current state fo quantum computer and how quantum-HPC integration
Open discussion from the experts allows the subject to be more revealing and relatable.
The depth of knowledge and experience of the speakers. Variety of backgrounds and programs/projects/ institutions represented by speakers
It helped with perspective on CI and quantum with a lot of different examples and voices.
I think the theme of integration over isolation.
Awareness of collaborations that exist regionally and nationally.
Interesting material
the diverse conversation about AI and how it can help - and also how we need to protect and manage research data in regards to AI.
Introductions to the area and current research related applications and pragmatic suggestions for getting started. We serve Ph.D. and Post doc researchers and graduate students from all areas of the university and must be mindful of their levels
The diversity of the speakers and Q&A.
Being online and open forums for back-n-forth and questions.

Question 8: What would you recommend as the next focus area or project for the ERN and why?

8 responses

What would you recommend as the next focus area or project for the ERN and why?
AI for science real use cases. How institution protect IP and implement security, compliance, and cost while integrate AI into research workflow and improve research productivity and research integrity.

Continuing the programs that promote access to these resources is important.
Present an on-ramp from HPC (CPU/GPU) to Quantum - describe the transition process and change in practices that can guide teams who might want to make the leap.
I have a full time regular IT job and do essentially all of the HPC support for my institution - mostly MPI on a small cluster and a little AI with local GPUS so any topic is newish and helpful to me.
I'd like to dig into examples of effective workforce adoption at the university level and what it might look like or better, what it does look like at institutions that have implemented it already.
Data
AI Literacy and Model Training for Researchers and Ph.D's outside of Machine Learning/Deep learning and STEM Disciplines already using these (i.e. Materials Science, Biotechnology, Engineering)
Have some hard actionable items for each talk... i.e. key points or mission statements about what the take away for the talk is ("what we want you to get from this"), but don't it over-shadow open discussion and, to be frank, some of the disagreements that could come up.

Question 9: Please add any final comments you wish to share with the ERN Steering Committee.

11 responses

Please add final comments you wish to share with the ERN Steering Committee.
Thank you for another great summit! If we get to do it in person again a hybrid model would allow for more participation.
It was a great meeting, great open discussion!
Mahalo nui!
This was informative, time well spent. Thank you.
I appreciate this being virtual and half a day to make it manageable to both block my calendar and be able to attend easily.
Thank you to all panel members and the keynote speaker. The summit was extremely informative and interesting.
Thank you for putting on this event - organizing such events takes a lot of time and effort, and they are essential to keep the community learning from each other.
Great introductions to these technologies!
Thank you!

the use of webinar mode was ineffective and didn't provide the opportunity for interactive sessions
Compliance and security are the hot topic in conjunction of how to manage big data, how to properly plan for and what kind of infrastructure is needed. AI use in research is obviously critical, but AI's impact on its ability to bypass security/compliance is growing at an almost larger rate.