WORKSHOP REPORT

ERN Summit 2025 (Virtual)
April 23, 2025

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ABSTRACT

This document reports on the Ecosystem for Research Networking Summit (virtual) that took place April 23, 2025.

1. EXECUTIVE SUMMARY

The **Ecosystem for Research Networking (ERN) Summit 2025**, held virtually on April 23, 2025, brought together leaders from academia, industry, and national organizations to explore the transformative impact of Artificial Intelligence (**AI), Quantum technologies, and workforce development** on regional and institutional research ecosystems. Co-chaired by Forough Ghahramani (NJEdge) and Maureen Dougherty (ERN), the Summit built on prior efforts to broaden access to cyberinfrastructure and catalyze multi-campus collaborations.

The 2025 agenda was designed to connect diverse perspectives across research-intensive universities, smaller institutions, and public-private partnerships. With keynote insights from **Dr. Dan Stanzione**, Executive Director of Texas Advanced Computer Center (TACC), and three expert panels, the event examined how advanced technologies are reshaping infrastructure needs, disrupting traditional research computing models, and amplifying the urgency for inclusive, adaptive workforce strategies.

Key themes from the day included:

- The rapid evolution of **AI as a disruptive force** across research and HPC ecosystems, driving both opportunity and cost pressures.

- The need to **rethink infrastructure, curricula, and collaborations** to prepare the workforce for emerging quantum and AI-driven fields.
- A growing call to **equitably distribute access** to research instruments and expertise, particularly for non-R1 institutions and underserved regions.
- The role of ERN as a **facilitator of shared infrastructure, best practices, and cross-sector dialogue**, helping to shape sustainable models for inclusive innovation.

The Summit concluded with an open discussion calling for sustained ERN community engagement, expanded infrastructure coordination, and shared strategies to navigate the fast-changing research and workforce landscape.

A summary of findings and recommendations of the overall findings and recommendations are listed here and details are included in the body of the report. The ERN Summit 2025 underscored that while artificial intelligence (AI) and quantum technologies are rapidly transforming the research and education landscape, access to the infrastructure, expertise, and curricular models needed to leverage these advancements remains uneven. Institutions of all types, from flagship research universities to non-R1 campuses, expressed a shared urgency around preparing a hybrid, interdisciplinary workforce. Panelists repeatedly highlighted that non-R1 institutions, while under-resourced, are deeply engaged in innovation through regional collaboration, shared infrastructure models, and creative curriculum integration. Industry speakers, including NVIDIA, reinforced the importance of high-performance computing (HPC) and software efficiency as foundational skills in both AI and quantum domains, with growing demand for accessible, hands-on educational tools.

Summit participants recognized the ERN's unique role in bridging these gaps, acting as a convener, infrastructure coordinator, and platform for community-driven learning. Several key proposals emerged from the sessions, including launching a **Quantum Student Data Corps**, expanding the **cloudlet pilot program** to improve access to research instruments, and creating **cross-institutional learning circles** to build faculty and staff capacity in emerging technologies. There was strong consensus around the need to **formalize storytelling efforts** that highlight real-world challenges and incremental progress, especially for underrepresented institutions and student populations.

To sustain momentum, the Summit called for funding agencies to invest in **federated infrastructure**, **microcredentialing**, and **regional innovation hubs** that align workforce development with long-term economic strategies. Institutions were encouraged to co-develop curriculum and training models, leverage cloud-based platforms for simulation and research, and build internal champions for AI and quantum literacy. A recommendation was made to fund an initiative similar to the National Artificial Intelligence Research Resource for Quantum. Finally, regional stakeholders were urged to establish AI and quantum task forces that align educational efforts with state-level economic and technology priorities, ensuring that no institution or community is left behind in the next wave of scientific discovery.

2. CONTEXT AND OBJECTIVES

The ERN Summit 2025 convened members of the scientific and cyberinfrastructure research community to advance the mission of the Ecosystem for Research Networking (ERN): democratizing access to advanced cyberinfrastructure, research instruments, data, and expertise. The opening remarks emphasized ERN's role as a catalyst for collaboration, inclusion, and innovation in a research landscape increasingly shaped by AI, quantum technologies, and data-intensive science. The mission was framed as not only technical but also deeply human and institutional—encouraging participants to foster intentional partnerships across diverse institutions, share blueprints for collaborative progress, and engage in shaping a future where access to innovation is not constrained by geography, institutional size, or systemic inequities.

The Summit objectives reflected the ERN's commitment to fostering inclusive, collaborative, and forward-looking research environments. by bringing together voices from research universities, community colleges, industry, and government to explore successes and challenges in leveraging local, regional, and national resources. Participants engaged in open discussion on community-driven priorities, including AI, quantum computing, high performance computing, big data, cybersecurity, and workforce development.

Key objectives of the Summit included:

- **Advance Learning and Collaboration:** Facilitating knowledge exchange on challenges, solutions, and successful models across institutions and regions.
- **Address Emerging Technologies:** Examine the dual promise and risks of transformative technologies such as AI and quantum computing, emphasizing the importance of partnerships and collaboration.
- **Democratizing Access:** Advancing access to research tools, data, and infrastructure.
- **Foster Workforce Development:** Identify strategies and partnerships to prepare and support a skilled professional capable of navigating emerging fields and technologies.
- **Updates on ERN initiatives:** Highlighting progress and achievements from collaborative ERN initiatives.
- **Future Planning:** Exploring new projects, convenings, collaborations, and resource-sharing models that build capacity and strengthen connections across regional and national research ecosystems.

These objectives guided the Summit's agenda, which wove together policy, practice, and vision to empower institutions of all sizes to shape a future where access to research innovation is not limited by geography or institutional capacity. The Summit involved a diverse set of stakeholders, including domain researchers, research computing professionals, network and system administrators, campus Deans, CIOs and other administrators, and regional network leaders. The Summit attracted over 100 participants from more than 101 distinct organizations. Most attendees were from academic institutions, including R1's and non-R1's. Other organization types included consortiums, The National Science Foundation (NSF), industry participants, and regional/national networking organizations. A complete list of registrant affiliations and job titles is provided in the Appendix to this report.

3. WORKFORCE DEVELOPMENT AND EDUCATION

One of the major components of the ERN's mission is education. This section highlights education and workforce development insights shared during the Summit, with a particular focus on building inclusive, hybrid talent pipelines in AI and quantum technologies.

Key Findings

- **Hybrid Workforce Demand in AI and Quantum:** NVIDIA emphasized that a next-generation workforce must be trained to operate across traditional high performance computing and emerging quantum platforms. Skills in simulation, AI model development, and quantum algorithms are increasingly integrated, and educational programs must reflect this convergence.
- **Smaller Institutions Are Innovating Amid Constraints:** Panelists from non-R1 institutions—such as Franklin & Marshall, Colgate, Carleton, Alabama State, and Swarthmore—highlighted creative adaptations like shared HPC frameworks, regional consortia, and AI integration into liberal arts curricula. These innovations demonstrate strong commitment despite limited resources.
- **Interdisciplinary, Stackable Pathways Are Essential:** Institutions like Middle Tennessee State University (MTSU) and collaborators in the Quantum Collaborative are leading efforts to embed quantum education across departments and academic levels, using boot camps, cloud platforms, and applied internships to build flexible, equitable entry points into technical careers.

Recommendations

- **Develop Shared AI and Quantum Curriculum and Microcredentials:** ERN and its partners should support modular, interdisciplinary curriculum development in partnership with industry (e.g., NVIDIA), tailored to institutional capacity and focused on real-world tools like CUDA-Q and hybrid AI/QC workflows.
- **Support Faculty and Staff Upskilling Through Learning Circles:** Create cross-institutional, interdisciplinary faculty learning communities—particularly among non-R1s—to accelerate AI/HPC/Quantum readiness, promote shared teaching resources, and build a stronger educator support network.
- **Launch a Quantum Student Data Corps:** Modeled on the National Student Data Corps, this initiative would provide students from two- and four-year institutions opportunities to engage in quantum-aligned projects like data labeling, algorithm testing, and simulation exercises—lowering barriers to entry and strengthening early identity formation in technical careers.
- **Establish Inclusive Workforce Metrics and Evaluation Practices:** Given the evolving nature of AI and quantum roles, success metrics should include student persistence, interdisciplinary collaboration, and identity development in addition to traditional enrollment and completion data.

4. PRESENTATION AND PANEL SESSIONS

Summit Welcome

Forough Ghahramani, ERN Summit Co-Chair, provided welcome remarks that emphasized the event's role as a catalyst for collaboration, inclusion, and innovation in the rapidly evolving research ecosystem. The mission of the Ecosystem for Research Networking (ERN) was framed as one focused on democratizing access to advanced cyberinfrastructure, research instruments, data, and expertise for institutions of all types and sizes. AI and quantum technologies were identified as areas of transformative potential. The agenda was designed to integrate perspectives from research universities, non-R1 institutions, industry partners, and government, reflecting ERN's commitment to building research ecosystems capable of adapting to emerging technological disruptions. Participants were encouraged to engage actively, share challenges and solutions openly, and explore how their institutions and regions could contribute to a future in which access to innovation is not constrained by geography or institutional capacity.

Opening Remarks and ERN Overview

Maureen Dougherty, ERN Summit Co-Chair , introduced Barr von Oehsen, Director of the Pittsburgh Supercomputing Center (PSC) and Chair of the ERN Steering Committee, who opened the Summit by welcoming attendees and reflecting on ERN's evolving focus and recent progress. He began by framing the central theme of the day: the meaning of "networking" in the ERN context. While technical networking, the linking of computer systems, is a key part of ERN's mission, Bar von Oehsen emphasized that ERN prioritizes the **human and institutional aspects of networking**: building professional relationships, exchanging knowledge, and fostering collaborations across institutions of all types and sizes.

He restated ERN's mission: to **simplify, support, catalyze, and foster multi-campus collaborations**, especially by helping academic institutions, regardless of size or classification, share policies, training, data, instruments, and infrastructure. He noted that the organization is especially focused on **democratizing access to scientific resources**, including technical expertise and research instruments.

Barr von Oehsen described the current research environment as one where **competitiveness is tightly linked to access**, not just to computing power, but to **data, cyberinfrastructure, and research tools**. While artificial intelligence is widely discussed, he cautioned that its power depends entirely on access to quality data and research environments. Too often, smaller and mid-sized institutions are left behind due to **underinvestment**, which ERN seeks to address through greater coordination and resource-sharing.

He referenced the **ERN Summit 2024**, held at the Pittsburgh Supercomputing Center, and encouraged attendees to view the publicly available reports and recommendations that emerged from that event. Many of the ideas presented today were influenced by input from researchers and stakeholders across the ecosystem. Those past recommendations weren't just aimed at ERN, but also at funding agencies, R1 institutions, and smaller colleges, encouraging a collective approach to building collaborative and inclusive research infrastructure.

Currently, ERN is concentrating its efforts on **expanding access to research instruments and the data they generate**. As part of this effort, ERN has developed a pilot initiative funded by the National Science Foundation to **test infrastructure that brings computing capabilities closer to the research instruments themselves**, a concept referred to as **edge computing**.

Barr von Oehsen described ERN's **"cloudlet" model** — a lightweight, containerized compute layer placed near research instruments. These edge devices allow remote users to interact with instruments, access data, and run AI or data processing microservices through user-friendly interfaces like **Open OnDemand**. The long-term vision is to create a **network of interconnected cloudlets** that provide seamless, federated access to instruments, data services, and mid-scale infrastructure. These would serve as bridges between local campuses and large-scale platforms such as **ACCESS**, the **Open Storage Network (OSN)**, the **Open Science Grid (OSG)**, and commercial cloud providers.

A few test sites have already begun piloting this model. Bar von Oehsen noted that initial feedback has been positive, and the team is preparing to expand the initiative and refine the design based on broader community needs.

He concluded by acknowledging the role of the **ERN Steering Committee**, which meets biweekly to guide strategy, evaluate pilot projects, and ensure community alignment. Their continued input, along with that of the broader community, will be instrumental in scaling this infrastructure and shaping ERN's collaborative future.

Keynote :"AI and HPC, or AI Ends HPC"

Dr. Dan Stanzione, Executive Director of Texas Advanced computing Center delivered the keynote, which provided a provocative and illuminating exploration of how **artificial intelligence is reshaping the landscape of high-performance computing (HPC)** and scientific discovery. Framed around the question "*Is AI the end of HPC?*," Dr. Stanzione argued that rather than replacing HPC, AI is transforming it—requiring the community to rethink architecture, software, workforce strategy, and environmental impact.

Key Insights:

- **Disruption of the HPC Status Quo**: AI has become a dominant force in scientific and commercial computing, shifting funding, infrastructure priorities, and innovation to models optimized for AI workloads. The scale of investment—especially in GPUs and AI-specific infrastructure—has dwarfed traditional HPC budgets.
- **HPC Roots in AI's Rise**: Many of the architectural foundations and algorithmic innovations now fueling modern AI originated from the HPC community. Technologies like **GPUs, high-speed interconnects, MPI, parallel processing**, and open-source software were pioneered by researchers in academia and national labs.
- **Energy and Cost Challenges**: The surge in demand for AI compute is driving up infrastructure costs and energy usage to unsustainable levels. Stanzione noted that while traditional data centers have become highly efficient, **the real inefficiencies lie in software**, underscoring a critical need for optimization.

- **Call for AI Efficiency**: He challenged the research community to prioritize **AI efficiency**—improving algorithmic and code performance to reduce compute waste. Referencing the *DeepSeek* model and mixed-precision methods, he showed how **smart software engineering can outperform brute-force scale**.
- **Preserving Scientific Computing**: With 64-bit precision computing falling out of favor in hardware design, there's a risk that scientific workloads will lose support unless the community adapts. Stanzione called for HPC to **evolve alongside AI**, leveraging shared infrastructure while advocating for scientific priorities.
- **Empowering Innovation at All Scales**: Finally, he emphasized that impactful innovation doesn't require massive infrastructure. **Algorithmic creativity and experimentation can thrive at smaller institutions**, positioning them as key players in advancing responsible and efficient AI.

In the Question and Answer (Q &A) that followed his keynote, Dr. Dan Stanzione fielded questions centered around the sustainability and future direction of AI and high-performance computing (HPC). Addressing concerns from smaller institutions, he emphasized that meaningful contributions to AI efficiency can be achieved through algorithmic and software innovations that do not require massive infrastructure—highlighting the value of ingenuity over scale. On the issue of AI hardware's trend toward low-precision computation, Stanzione warned of potential risks to scientific accuracy and urged researchers to adapt algorithms or emulate higher precision to remain competitive. When asked about academia's role amid industry dominance, he underscored the unique position of universities in advancing ethical AI, foundational research, and algorithmic innovation—areas where corporate investment is often lacking. He cautioned against academic disengagement, noting it would cede critical influence over the direction and governance of AI. In response to questions about policy, Stanzione called for sustained public investment in energy-efficient AI and research infrastructure to balance commercial pressures and preserve the priorities of scientific computing in the national research ecosystem.

Dr. Stanzione closed with a challenge: embrace AI as a transformative opportunity, not a threat, and lead the next wave of scientific discovery by marrying AI's power with HPC's rigor.

Panel 1"Regional Economic and Workforce Initiatives for AI and Quantum"

Moderated by **Barr von Oehsen** of the Pittsburgh Supercomputing Center (PSC), this panel brought together leaders advancing AI and quantum innovation at institutional, state, and regional levels. Panelists included **Craig Arnold** from Princeton University, **Michael Bennett** from Q-SEnSE at the University of Colorado Boulder, **Robert Harrison** representing Empire AI and Stony Brook University, and **John Goodhue** of the Massachusetts Green High Performance Computing Center (MGHPCC) and Harvard University. Together, they offered a multi-regional perspective on how AI and quantum initiatives are shaping economic development, workforce readiness, and infrastructure strategies.

Craig Arnold opened by highlighting Princeton University's leadership in forming the **NJ AI Hub—**a statewide collaborative initiative supported by the New Jersey Economic Development Authority (NJEDA) and **corporate partners like Microsoft and CoreWeave**. He described

Princeton's centralized AI Research Lab, which merges technical development with ethical and societal considerations, and shared examples of **AI applications in fusion research at the Princeton Plasma Physics Laboratory (PPPL)**.

Michael Bennett discussed workforce development efforts at **Q-SEnSE,** one of NSF's Quantum Leap Challenge Institutes. He emphasized programs like **Quantum Forge**, which connects students to startup internships, and **Quantum Research Exchange (QRX)**, which prepares students for research-intensive quantum careers. Bennett emphasized scalable, inclusive models of quantum education designed for cross-institutional replication and broader participation.

Robert Harrison introduced **Empire AI**, an AI initiative based in New York that brings together several academic institutions along with state funding support. Harrison described the focus of Empire AI on long-term regional sustainability and inclusive economic development, noting that close coordination between state and federal strategies is essential for creating lasting and equitable outcomes.

John Goodhue presented the **Massachusetts Green High Performance Computing Center (MGHPCC),** as **a model for federated cyberinfrastructure**, used by multiple institutions to support AI and scientific computing. He discussed how shared infrastructure can lower costs and broaden access, especially when coupled with educational outreach to community colleges and smaller institutions.

Barr von Oehsen shared how PSC is actively involved in both national efforts (e.g., ACCESS, NAIRR) and state-level initiatives focused on AI and workforce development. He underscored the importance of institutional agility and governance reform to keep pace with technological change and described PSC's involvement in the **ADAPT AI Institute**, which centers on trustworthy and responsible AI.

In the Q&A session, panelists addressed audience questions around hub replication, inclusive workforce pipelines, sustainable funding, and national-local alignment. On the topic of replicating models like the NJ AI Hub or Empire AI, Craig Arnold and Robert Harrison emphasized the importance of strong university leadership, early-stage state agency engagement, and proactive partnerships with industry. Barr von Oehsen added that university government relations teams play a crucial role in translating technical needs into actionable policy discussions.

Responding to questions about ensuring access for underrepresented institutions and communities, Bennett shared that Q-SEnSE actively partners with MSIs and community colleges, using programs like QRX to create accessible pathways into quantum education. Goodhue advocated for moving beyond outreach toward integration, where smaller institutions are not just included but empowered to co-lead initiatives.

On funding and sustainability, Robert Harrison stressed the necessity of diversified funding streams, federal, state, and philanthropic, to avoid dependence on short-term grants. Goodhue noted that when properly managed, shared infrastructure can yield long-term stability and reduce duplication across the ecosystem.

Finally, participants explored how local efforts can align with national strategies like NAIRR or state AI task forces. Barr von Oehsen shared that PSC facilitates these connections but highlighted the challenge of securing dedicated resources for coordination. Arnold concluded by stressing that innovation hubs must remain flexible, adapting to the evolving national landscape while staying grounded in regional workforce needs.

Panel 2 "Industry-Academic Partnerships for Preparing the Workforce for Quantum "

This panel explored how industry-academic collaborations are shaping the next generation of the quantum workforce, with an emphasis on inclusion, accessibility, and interdisciplinary models. The discussion was moderated by **Florence Hudson**, Executive Director of the Northeast Big Data Innovation Hub, whose opening remarks framed the national imperative to build scalable talent pipelines aligned with emerging technologies like AI and quantum. She noted that workforce development must reflect the needs based on quantum with AI, cybersecurity, and data science, and that cross-sector collaboration is essential for delivering scalable training solutions.

The panel featured insights from **Douglas Jennewein o**f Arizona State University, who highlighted the Quantum Collaborative model; **David Liu** of Purdue University Fort Wayne, who shared efforts to integrate quantum into broader tech education; **Hanna Terletska** of Middle Tennessee State University, who spoke about regional partnerships and inclusive teaching strategies; **Monica VanDieren** of NVIDIA, who provided an industry perspective on hybrid quantum-classical training; and **Benjamin Zwickl** of the Rochester Institute of Technology, who focused on identity-building and inclusive curriculum design informed by workforce research.

This panel explored how industry-academic collaborations are shaping the next generation of the quantum workforce, with an emphasis on inclusion, accessibility, and interdisciplinary models. Florence Hudson opened the session by framing the national imperative to build talent pipelines in emerging quantum technologies. She noted that workforce development must reflect the convergence of quantum with AI, cybersecurity, and data science—and that cross-sector collaboration is essential for delivering scalable and equitable training solutions.

Douglas Jennewein shared how Arizona State University is advancing workforce development through its leadership in the **Quantum Collaborative**, a statewide effort uniting universities, industry (including IBM and NVIDIA), national labs, and nonprofits. He described how ASU's research computing and cyberinfrastructure teams play a key role in enabling quantum education. The initiative integrates quantum into education pipelines from K–12 through graduate school, including partnerships with organizations such as **Qubit by Qubit**, **MetaSparks**, and **Day of Quantum**. These collaborations help deliver hands-on exposure, mobile STEM labs, and experiential learning opportunities. He stressed the importance of sustainable institutional partnerships and emphasized that investment in faculty and infrastructure is required to move from aspiration to implementation.

David Liu described his institution's approach to blending quantum into a broader ecosystem of AI, cybersecurity, and emerging tech education, ensuring alignment with workforce needs. He noted that Purdue Fort Wayne is part of **NVIDIA's CUDA-Q academic program** and is leveraging **NSF I-Corps** to explore technology commercialization pathways. Liu highlighted the importance of integrating quantum into undergraduate computer science and engineering curricula, even at teaching-focused institutions. His efforts include interdisciplinary courses, cloud-based simulations, and outreach to students unfamiliar with quantum. He emphasized that preparing a broad workforce for hybrid quantum-classical computing environments requires pedagogical creativity and strong institutional support.

Hanna Terletska shared the expansion of the **Quantum@MTSU** initiative and the **Tennessee Quantum Materials Workforce Development Project**, which partners with **Oak Ridge National Lab**, local industries, and regional institutions. She described how MTSU is embedding quantum content across departments—from physics to chemistry and data science—and retraining faculty to teach quantum topics. Her programs emphasize hands-on research, peer mentorship, and faculty-student collaboration. She also stressed equity: MTSU targets first-generation and underrepresented students and builds accessible pathways that do not rely on graduate-level specialization. Through workshops, boot camps, and certificate programs, the initiative is building a regional talent base for Tennessee's quantum economy.

Representing industry, Monica VanDieren explained how **NVIDIA supports hybrid computing education**, preparing students to work with both **quantum processing units (QPUs)** and classical HPC infrastructure. She discussed NVIDIA's focus on simulation-based quantum learning using platforms like **CUDA-Q** and how these tools can expand access to quantum concepts for institutions without physical hardware. Monica VanDieren described how industry needs are evolving and stressed that curriculum alignment is critical. She encouraged deeper dialogue between academia and employers, especially to ensure that students build **transferrable skills** in AI, HPC, and quantum domains. She also shared examples of **internships and mentorship** pipelines designed in partnership with universities.

Ben Zwickl brought a human-centered lens, grounded in his **NSF-funded research** on quantum career pathways. He highlighted how students often feel uncertain or excluded from quantum fields due to perceived complexity or lack of exposure. His work focuses on designing **inclusive learning experiences**, from first-year courses to capstone projects, that demystify quantum science and help students build identity and confidence. He stressed the importance of **interdisciplinary education**, not just as a pedagogical tool but as a workforce necessity—most quantum roles will involve integration with data, design, or engineering teams. Zwickl's research shows that **perceptions of career alignment** influence student persistence, and that inclusive quantum education must explicitly address these psychosocial dimensions.

During the Q&A discussion, attendees asked how to bring quantum to under-resourced institutions and whether a Ph.D. is necessary for most future quantum jobs. The panelists universally agreed that **many quantum workforce roles will not require advanced degrees**, and that two- and four-year institutions must play a central role.

Hanna Terletska emphasized that **accessible, skills-based pathways**—such as stackable certificates and applied internships—are critical for expanding opportunity. David Liu noted that **democratizing access to simulations and cloud platforms** allows any institution to join the ecosystem. Monica VanDieren added that industry is eager to support **early talent development** if academia can deliver graduates with both **technical depth and adaptable thinking**.

One attendee asked how these efforts are being evaluated or sustained. Douglas Jennewein responded that **community-building and ecosystem mapping** are vital, while Benjamin Zwickl called for **systematic research** into student outcomes, identity formation, and equitable program design.

Panel 3 "Perspectives from Non-R1 Smaller Institutions"

This panel, moderated by **Carrie Rampp** (Franklin & Marshall College), featured perspectives from leaders at smaller, non-R1 institutions: **Kyriakos Tsoukalas** (Colgate University), **Damien Clarke** (Alabama State University), **Wiebke Kuhn** (Carleton College), and **Jason Simms** (Swarthmore College). The discussion explored the unique challenges, innovations, and collaborative strategies emerging from smaller institutions as they work to strengthen their research computing infrastructure and engagement. Carrie Rampp framed the conversation around how these campuses are adapting to emerging technologies, supporting faculty, and navigating resource limitations.

Kyriakos Tsoukalas shared that Colgate University supports a small but active HPC environment, accessible to faculty, staff, and students. Their priorities include improving infrastructure and cybersecurity, transitioning to a more scalable private cloud architecture, and experimenting with AI and quantum computing tools. Colgate is renovating its server rooms in preparation for higher-power demands and liquid cooling and is strategically separating HPC from high-throughput computing services to better serve research and educational workloads.

Damien Clarke from Alabama State University emphasized their early-stage journey in advanced research technologies. While not yet engaging in quantum initiatives, the institution is conducting notable AI-related research supported by NSF, NIH, the Army Research Lab, and the Navy. Projects include smart cities, vehicular networks, and cancer research. Clarke highlighted a two-pronged AI approach: faculty AI tutors for research and administrative digital twins for workflow optimization. He also stressed the role of leadership in creating the infrastructure to support faculty and student innovation, even in resource-constrained environments.

Wiebke Kuhn of Carleton College spoke to the tension between aspiration and scale. While Carleton is not yet a hub for advanced computing, it is integrating AI into teaching through tools like Vanderbilt's Amplify and Google's Gemini. Carleton is also leading a collaboration with St. Olaf and Macalester Colleges to build a regional network and resource-sharing framework for HPC, supported by a faculty career enhancement grant. Their goal is to help ITS staff connect faculty to national resources such as ACCESS and Open Science Grid, and to empower faculty in traditionally non-computational fields to envision research possibilities using these technologies.

Jason Simms described how Swarthmore College has embraced a blended teaching-research mission. Swarthmore recently launched a joint HPC cluster with Lafayette College to smooth demand and expand capability. This collaboration, supported by a CC* grant for Pennsylvania's state-wide Science DMZ, is improving connectivity and bolstering capacity. Simms emphasized the importance of community engagement through groups like Campus Champions, Campus Research Computing Consortium (CaRCC), and the Research Computing at Smaller Institutions (RCSI) conference, which he helps organize. These communities offer training, mentorship, and support that are especially valuable to small institutions lacking deep bench strength. He pointed out that many of the challenges faced by non-R1s mirror those at R1s but must be tackled with fewer resources and staff.

In the discussion, panelists expanded on how partnerships, whether with state R&E networks, peer institutions, or national programs, are essential for scaling research computing at smaller institutions. Clarke discussed mentorship from peers at more established institutions and leveraging relationships to write stronger grants. Tsoukalas mentioned Colgate's partnership with NYSERNet and the Texas Advanced Computing Center for infrastructure advice. Simms described Swarthmore's active role in the RCSI community and how collaboration with Lafayette College has allowed them to serve more researchers, including students working independently.

The emerging themes during the Q& A part of this session included:

- **Barriers to national resource adoption**: Faculty at smaller institutions often find allocation processes (credits, accounts, renewal cycles) overwhelming. Panelists advocated for microservices or lightweight entry points to national infrastructure and emphasized the importance of human connection and sustained mentorship to reduce onboarding friction.
- **Inclusion in national efforts**: Clarke critiqued some national partnerships as superficial or performative. He and others called for meaningful, sustained relationships that include capacity-building and attention to context.
- **Student engagement**: Despite a strong desire to involve students in HPC operations, panelists noted that onboarding students takes significant time and training. The panel emphasized the need for structured mentorship, funding, and safe environments (e.g., VMs with limited access) to allow students to contribute meaningfully.
- **Staffing and sustainability**: With lean IT teams, institutions rely on cross-training, strategic outsourcing, and shared services. However, they noted challenges around succession planning and loss of institutional knowledge due to staff turnover.
- **AI and Quantum Readiness**: While interest is high, AI and quantum technologies are not yet significantly shaping staffing or infrastructure decisions. Panelists indicated a wait-and-see approach, dependent on clearer industry developments and available guidance from national centers.

Throughout the panel, a shared ethos emerged: smaller institutions can be agile, collaborative, and highly innovative, but need inclusive infrastructure, thoughtful partnerships, and access to training to fully participate in the evolving research ecosystem.

Discussion and Closing remarks

The final discussion and closing session of the ERN Summit 2025, moderated by Barr von Oehsen, Forough Ghahramani, and Maureen Dougherty, reflected the energy, candor, and collaborative spirit that defined the day. It brought together panelists, participants, and facilitators in a reflective and action-oriented dialogue—looking ahead to what comes next for the ERN community.

The dynamic and future-oriented dialogue synthesized the day's insights and explored actionable strategies for sustaining and expanding the ERN community's impact. Framed around the question of how to build a more connected and responsive research ecosystem, the discussion emphasized ERN's dual strength, its regional grounding and national relevance. Participants recognized ERN not only as a technical enabler but as a community-building platform that bridges access to infrastructure, mentorship, and opportunity across diverse institutional types.

The conversation surfaced key themes and strategic directions. One recurring idea was the importance of maintaining ERN engagement throughout the year, with proposals for quarterly convenings of working groups to sustain momentum. There was strong interest in leveraging ERN's platform to co-develop and co-teach curriculum pilots in emerging fields like AI and quantum, supported by shared cloud and simulation tools. Participants underscored the value of storytelling—highlighting not just successes but also challenges and incremental progress—as a form of inclusive workforce development that resonates with students from underrepresented campuses. Regional partnerships were identified as critical to co-funding infrastructure and addressing staffing and training gaps, with "shared wins" seen as key to institutional buy-in. The group also reflected on ERN's potential to serve as a model for helping smaller and less-resourced institutions engage early with next-generation technologies before access becomes limited by exclusivity or cost.

Several concrete proposals emerged from the dialogue. These included creating a Quantum Student Data Corps, modeled after the National Student Data Corps, to engage students in processing quantum datasets while learning foundational concepts. Regional internships and apprenticeship models were proposed, linking students to hands-on training opportunities through NSF-funded cyberinfrastructure projects, potentially in coordination with workforce and economic development agencies. Participants also suggested developing an ERN "resource map"—a centralized, interactive directory of datasets, instruments, training tools, and collaborators—to improve resource discovery. Another proposal called for establishing cross-institutional learning circles for faculty and staff focused on AI, quantum, and HPC, supported by mentorship from R1 institutions and national labs.

In concluding the session, participants affirmed ERN's unique role in not only enabling research but also expanding who gets to participate, lead, and shape the underlying infrastructure. Attendees were encouraged to remain engaged, propose initiatives, and actively include new voices in the ongoing development of the ERN ecosystem.

5. FINDINGS

The ERN Summit 2025 revealed that while AI and Quantum technologies are transforming the research landscape, significant disparities in access, infrastructure, and workforce preparedness persist across institutions. Key findings are summarized below:

- **Regional Collaboration Is a Critical Success Factor**
  Successful initiatives like the NJ AI Hub, Empire AI, and MGHPCC demonstrate that regionally anchored models, with strong academic leadership, industry alignment, and policy engagement, are essential to advancing AI and Quantum innovation. These models leverage public-private partnerships and focus on inclusion, scalability, and economic development.
- **Non-R1 Institutions Are Under-Resourced but Highly Engaged**
  Panelists from non-R1 institutions, including Colgate University, Swarthmore College, Franklin & Marshall, Alabama State University, and Carleton College, highlighted innovations despite constrained infrastructure. These campuses are exploring shared services, faculty empowerment, and creative teaching models, but still face challenges with scalability, sustainability, and equitable access to national resources.
- **Infrastructure and Curriculum Gaps at Smaller Institutions**
  Many non-R1 institutions lack the computational infrastructure, faculty capacity, and industry-aligned curriculum to keep pace with advances in AI and quantum technologies. These constraints limit their ability to fully participate in research and workforce development initiatives.
- **Quantum and AI Workforce Requires HPC Literacy**
  NVIDIA's presentation emphasized that the journey from quantum theory to practical supercomputing applications necessitates a hybrid workforce proficient in both HPC and quantum computing. There is a growing gap in educational programs that integrate these competencies, particularly at smaller or non-R1 institutions.
- **Shared Infrastructure Enables Democratized Participation**
  Federated models such as MGHPCC and the ERN's proposed network of cloudlets (edge compute nodes near instruments) were praised for supporting equitable access to AI/HPC tools. These infrastructures facilitate both experimentation and production workflows for smaller institutions, enabling them to participate meaningfully in national research.
- **Workforce Development Requires Multi-Institutional, Inclusive Approaches**
  Efforts like Q-SEnSE, the Quantum Collaborative, and programs at MTSU and Purdue Fort Wayne illustrate that diverse, stackable educational pathway, such as internships, cloud-based labs, and boot camps, are central to training a hybrid workforce for AI and quantum careers. These programs must be designed with equity, flexibility, and interdisciplinary engagement at their core.
- **State Engagement Requires Mediation and Coordination**
  Efforts to educate and align with state governments (e.g., in New Jersey and Pennsylvania) showed that engagement is complex but essential. University government

relations teams, consortia like ERN, and technical intermediaries such as PSC play a key role in bridging the gap between research institutions and public policy leaders.

- **Humanities and Interdisciplinary Fields Are Integral to the Future of AI**
  As shared by Princeton University, AI is increasingly embedded not only in STEM but in the humanities and social sciences. Research questions around equity, bias, misinformation, and cultural context are central to ethical AI deployment and must be part of cross-sector collaboration strategies.

6. RECOMMENDATIONS

Informed by the insights and discussions at the Summit, the following recommendations are proposed for the ERN community, funding agencies, academic institutions, and regional stakeholders:

For the ERN Community

- **Develop Shared, Modular HPC+Quantum Computing (QC) Learning Pathways**
  ERN, funding agencies, and academic consortia should collaborate with industry partners like NVIDIA to create and disseminate **modular, competency-based curricula** in AI and quantum computing. These should include **hands-on exposure to GPUs, QPUs, and hybrid workflows** using tools like CUDA-Q, and be adaptable to different institutional capacities.
- **Establish a Community Storytelling Platform**
  Develop a digital storytelling initiative to showcase "real stories" from member institutions—highlighting not only successes but also challenges and lessons learned. These narratives can humanize workforce development, support peer learning, and affirm the value of incremental progress.
- **Coordinate a Quantum Student Data Corps**
  Pilot a student engagement program focused on Quantum Science, modeled after the National Student Data Corps. Students could contribute to basic data annotation, algorithm testing, or educational material development while gaining early exposure to quantum concepts.
- **Expand the Cloudlet Pilot**: Continue to develop and deploy the edge-computing cloudlet model to facilitate access to instruments, data processing, and AI microservices, focusing on non-R1 implementations and collaborations.
- **Formalize Inclusive Governance Models**: Continue to evolve ERN working groups to include more voices from MSIs, community colleges, and non-R1 institutions, ensuring that strategic direction reflects diverse institutional needs. Explore the inclusion of Quantum and AI working groups.
- **Strengthen Year-Round Engagement**: Maintain momentum by hosting virtual town halls, resource-sharing sessions, and joint project development workshops beyond the annual Summit.

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

- Invest in a Quantum initiative similar to the National Artificial Intelligence Research Resource (NAIRR) Pilot**, Quantum Research Resource** (QR^2).
- **Prioritize Scalable, Shared Infrastructure**: Fund federated access models that connect smaller institutions to mid- and large-scale cyberinfrastructure.
- **Incentivize Regional Innovation Hubs**: Support place-based, cross-sector models that align workforce, research, and industry development (e.g., NJ AI Hub, Empire AI).
- **Invest in AI for the Humanities and Ethical Research**: Allocate dedicated funding for interdisciplinary AI projects, especially those rooted in societal impact, fairness, and inclusion.
- **Support Regional Apprenticeship and Internship Networks**
  Provide targeted funding for cyberinfrastructure internships that embed students in regional hubs or multi-campus collaborations. Rotational placements across institutions can help develop cross-platform literacy and build regional workforce pipelines.
- **Invest in Infrastructure Incentives for Shared Wins**
  Offer matching funds or co-investment models for regional infrastructure consortia involving at least one non-R1 institution. Emphasize shared governance, pooled staffing, and collaborative use policies.
- **Fund Community-Led Storytelling and Mentorship Models**
  Recognize the importance of "soft infrastructure" such as community building, mentorship, and storytelling. Fund pilot programs that combine communication, technical training, and institutional capacity-building.

For Academic Institutions

- **Build Internal AI/Quantum Literacy**: Create internal structures (e.g., AI labs, faculty development programs) that lower barriers to entry for non-specialists and connect researchers across disciplines.
- **Expand Access Through Federated Infrastructure and Micro-Credentials**
  Leverage federated models (e.g., MGHPCC) to provide **remote access to GPU/QPU resources** for teaching and research at non-R1 institutions. Pair this access with **micro-credentialing** programs to certify faculty and students in AI and quantum tools, lowering the barrier to entry and expanding inclusive participation in the national AI and QC workforce.
- **Empower Government Relations Offices**: Coordinate research and public policy messaging to advocate for institutional priorities with state governments.
- **Partner Across Peer Institutions**: Form regional consortia among similar-sized institutions to share staff, platforms, and training programs—mirroring MGHPCC's success model.
- **Engage Students in Research Communication Roles**
  Involve undergraduates and graduate students in creating digital media (videos, blogs, podcasts) that highlight research experiences, technologies, and career

pathways—building both science communication skills and broader institutional visibility.

- **Create Cross-Institutional Faculty and Staff Learning Circles**
  Formalize small cohort-based learning communities to support AI, HPC, and Quantum upskilling among faculty and staff. These circles should be interdisciplinary, span multiple institutions, and be facilitated by experienced mentors.
- **Promote Cross-Institutional Course Sharing**
  Collaborate on co-taught foundational courses in AI, Quantum, or Cyberinfrastructure. Use shared platforms and cloud tools to make introductory modules accessible across institutions regardless of size or technical resources.
- **Align Learning Circles with Faculty Incentives**
  Ensure that participation in learning circles can count toward professional development credits, promotion criteria, or teaching innovation awards to incentivize sustained faculty engagement.

For Regional Stakeholders and State Governments

- **Engage with Research Institutions Early**: Include universities and colleges as co-creators in AI and quantum policy and economic development strategies.
- **Support Workforce Ecosystem Building**: Fund cross-institutional programs, from K–12 outreach to undergraduate research, that prepare diverse talent pipelines in AI and Quantum.
- **Enable Intermediary Organizations**: Empower communities like ERN to act as translators between government, academia, and industry—fostering aligned regional innovation agendas.
- **Establish Regional AI/Quantum Task Forces**
  Replicate models like the NJ AI Task Force to bring together academia, industry, and government in shaping inclusive innovation policy and workforce development strategies.
- **Fund Public-Private Talent Development Collaboratives**
  Support applied apprenticeships, internships, and rotational placements for students and faculty in AI/Quantum fields, embedded within regional innovation hubs and aligned with economic development priorities.
- **Include AI/Quantum in Statewide Curriculum Reform**
  Work with education departments and higher education councils to standardize exposure to AI/Quantum concepts in secondary and postsecondary education.
- **Sponsor Innovation Challenges and Hackathons**
  Encourage student and faculty engagement through state-funded innovation contests focused on practical applications of AI and quantum in domains like healthcare, energy, climate, and cybersecurity.

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 database 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 database. 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

8.2 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://www.ern.ci/event/the-ecosystem-for-research-networking-summit-copy/
Presentation materials are posted here. ?

8.2.2 Program Agenda

Ecosystem for Research Networking(ERN) Summit 2025 Agenda

April 23, 2025, 12pm-5pm ET - Virtual event

The Ecosystem for Research Networking (ERN) Summit 2025 provides the scientific and cyberinfrastructure research community an opportunity to come together and hear from industry, domain researchers and cyberinfrastructure (CI) professionals about the successes, opportunities and challenges related to Advanced Technologies, Quantum, AI and Workforce Development. There will be panel presentations and open discussions on the impact of AI and Quantum on regional economic and workforce initiatives, industry academic partnerships for preparing the workforce, and perspectives from the span of research institutions from R1 to non-R1 smaller institutions.

April 23 - Advanced Technologies - AI & Quantum (12:00PM-5:00PM EDT)

12:00 - 12:15 **Welcome**

Summit 25 Co-Chairs - Forough Ghahramani, Ed.D., Vice President for Research & Innovation, NJedge
Maureen Dougherty, Ecosystem for Research Networking(consultant)

Opening Remarks
Barr von Oehsen, Ph.D., Director, Pittsburgh Supercomputing Center (PSC)

12:15 - 1:15 **Keynote Speaker**

Dan Stanzione, Ph.D., Executive Director, Texas Advanced Computer Center (TACC), Associate Vice President For Research, UT-Austin, **"AI and HPC, or AI Ends HPC?"**

1:15 - 2:15 **Panel 1: Regional Economic and Workforce Initiatives for AI and Quantum**

Explore the interplay between advanced technologies and regional innovation ecosystems.

Moderator: **Barr von Oehsen**, Ph.D., Director Pittsburgh Supercomputing Center
Panelists:

- **Craig B. Arnold**, Ph.D., The Susan Dod Brown Professor of Mechanical and Aerospace Engineering and Vice Dean for Innovation, Princeton University
- **Michael Bennett,** Ph.D., Director of Education and Workforce Development, Q-SEnSE Quantum Leap Challenge Institute, University of Colorado Boulder
- **Robert J. Harrison**, Ph.D., Executive Director of Empire AI; Professor of Applied Mathematics & Statistics, Founding Endowed Director of the Institute for Advanced Computational Science (IACS), Stony Brook University
- **John Goodhue**, Executive Director, Massachusetts Green High Performance Computing (MGHPCC)
- **Barr von Oehsen,** Ph.D., Director, Pittsburgh Supercomputing Center (PSC)

2:15 -3:15 **Panel 2: Industry-Academic Partnerships for Preparing the Workforce for Quantum**

Explore curricular innovations and partnerships that prepare the future quantum workforce.

Moderator: **Florence Hudson**, Executive Director, Northeast Big Data Innovation Hub Columbia University
Panelists:

- **Douglas Jennewein**, Executive Director,Research Technology Office, Arizona State University (Quantum Collaborative)
- **David Liu,** Ph.D., Associate Professor of Computer Science, Quantum Science and Engineering Institute, Purdue University
- **Hanna Terletska,** Ph.D., QSInitiative Leader, Associate Professor, Department of Physics & Astronomy, Middle Tennessee State University (MTSU)
- **Monica VanDieren**, Ph.D., Senior Technical Marketing Engineer for Quantum computing and HPC, NVIDIA
- **Benjamin Zwickl,** Ph.D., Associate Professor, School of Physics and Astronomy, Rochester Institute of Technology

3:15 - 4:15 **Panel 3: Perspectives from Non-R1 Smaller Institution**

Highlight innovations, constraints, and opportunities unique to non-R1 institutions.

Moderator: **Carrie Rampp**, Vice President and Chief Information Officer, Franklin & Marshall College

Panelists:

- **Damian Clarke,** Ph.D., Vice President, Technology Services, Alabama State University
- **Wiebke Kuhn**, Ph.D., Director of Academic Technology, Carleton College
- **Jason Simms**, Ph.D., Research Computing Manager, Swarthmore College
- **Kyriakos Tsoukalas**, Ph.D., Associate Director, Research and High Performance Computing, Colgate University

4:15 - 4:45 **Open Discussion and Collaboration**

4:45 - 5:00 **Closing Remarks**

8.2.3 Summit Registrants/Participants

Affiliation	Role
Alabama State	Vice President, Technology Services
Amazon Web Services	Strategy Lead, Higher Ed Academic Research
American Indian Higher Education consortium	Cyberinfrastructure Facilitator
Amherst College	IT Research Computing Specialist
Amherst College	Executive Director PARCC
Arizona State University	Executive director, research technology officer
Campus champions	System Engineer
Carleton College	Director of Academic Technology
Carnegie Mellon University	Senior Associate Dean
Carnegie Mellon University	Associate Dean for Academic Engagement
Chapman University	Sr Research Scientist
Colgate University	Associate Director, Research and High Performance Computi
College of William and Mary	Assistant Director of Research Computing
Columbia University	Research Computing Specialist
Columbia University	Executive Director
Columbia University	IT Director
Cornell University	Associate Univ Librarian Emerita
Diné College	Vice Provost for Research
East Carolina University	Faculty
Elizabeth City State University	Assistant Professor (Bioinformatics)
Florida A&M University	Prof

Franklin & Marshall	Vice President and Chief Information Officer
Franklin & Marshall College	Director of Research Computing
Fred Hutchinson Cancer Center	Business Relationship Manager
Georgetown University	Director, Research Technologies
GraphStream Incorporated	CTO
GWU	Research Scientist
Illinois Tech	Dean of Libraries
Imperial College London/UK	Senior Research Computing Analyst
Internet2	Senior Research Consultant, retired
Iowa State University	Manager HPC
Ithaka S+R	Principal, The Research Enterprise
Jarvis Christian University	Associate Professor
Kansas State University	Librarian
KeystoneREN	Chief Relationship Officer
KSU	Professor
Lafayette College	Research Computing System Administrator
Library of Congress	Director of Digital Strategy
Link Oregon	Executive Director
Macalester College	Academic Technologist
MGHPCC	Executive Director
miami university	dept head
Miami University	Dean
Middle Tennessee State University	Associate Professor, Department of Physics & Astronomy
Montclair State University	Director - systems & Infrastructure Operations
National Center for Supercomputing Applications	Research Computing and Data Facilitator
National Science Foundation	Program Director
NC State University	Interim Director, Research Facilitation Service
NHS College	Faculty
NHS College	Faculty
NJEdge	vice president for research & innovation
North Carolina State University	Visiting Researcher
Northwestern University	Computational Specialist Assoc.
NVIDIA	Senior Technical Marketing Engineer
NYU	HPC Specialist
Ohio supercomputer center	Client engagement manager
Oregon State University	Associate Director
Oregon State University	Executive Director Research Computing
Pakistan Education and Research Network	Network Engineer
Penn State	Research Computing Software Engineer
Penn State	Engineer

Penn State University	Assistant Director for Innovation and Outreach
Princeton University	Senior Strategic AI Hub Project Manager
Princeton University	Vice Dean for Innovation
PSC	director
PSU - ICDS	Interim Director
Purdue University	Associate Professor of Computer Science
Purdue University Fort Wayne	Professor
Purdue University Fort Wayne	Professor
RENCI	System Administrator
Rensselaer Polytechnic Institute	VP of Enterprise Computing
Rochester Institute of Technology	Associate Professor, School of Physics and Astronomy
Stony Brook University	HPC
Stony Brook University	Executive Director of Empire AI
SUNY Administration	Director of Research Data Strategy
Swarthmore College	Research Computing Manager
TACC	Executive Director
Texas A&M University	User Support Specialist
The Ohio State University	IT Solutions Engineer
The Pennsylvania State University	Technical Director
The University of Texas at Austin Libraries	Assistant Director for Research Support and Digital Innovatio
TIND	COO
U of IL Urbana	Professor
U.S. National Science Foundation	Program Director
UBC	Support Analyst
UCLA	Computational Scientist
UMass Chan Medical School	Chief Research Computing Officer
UMB	IT
University at Buffalo	RCD Facilitator
University at Buffalo	Research Facilitator
University at Buffalo	RCD Facilitator
University at Buffalo	Research Facilitator
University of California San Diego	Director, Research IT Services
University of Cincinnati	Director, Advanced Research Computing Center
University of Colorado Boulder	Director of Education and Workforce Development
University of Delaware	Emeritus faculty
University of Iowa	Associate Director ITS Research Services
University of Kentucky	HPC Facilitator
University of Manitoba	Research Computing Coordinator
University of Minnesota	Scientific Computing Consultant
University of Nevada, Reno	HPC Engineer
University of Oklahoma	PhD Student

University of Oklahoma	Graduate Student Attendee
University of Pittsburgh	Instructor / AI Research
University of Pittsburgh	Center for Research Computing and Data
University of Rochester	STEM Liaison Librarian
University of Vermont	Director, Research Computing and Data, Large Research Initiatives
University of Wyoming / ARCC	Research Software Engineer
USC ISI	Senior Computer Scientist
UT Health San Antonio	HPC IT Architect
UVA SEAS	Assoc. Professor
UW Madison	System Admin
World Data System	Executive Director, International Program Office
Yale	Researcher

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 Summit Registration Statistics and Post-Summit Survey Results

This section highlights information about participant affiliations and results of the post-summit survey. 21% of attendees participated in the survey.

8.4.1 Summit Registration Statistics

Registration Statistics

ERN Summit 2025 Statistics	
Attendees	110
Institutions/Affiliations	92
R1	47

Non-R1	20
NREN/RENs	3
Consortiums	4
Library	2
Medical	4
Funding Agency	1
Industry	6
Foreign Institutions	5
States Represented	32
Countries Represented	4

Affiliation
Alabama State
Amazon Web Services
American Indian Higher Education consortium
Amherst College
Arizona State University
Campus Champions
Carleton College
Carnegie Mellon University
Chapman University
Colgate University
College of William and Mary
Columbia University
Cornell University
Diné College
East Carolina University
Elizabeth City State University
Florida A&M University
Franklin & Marshall College
Fred Hutchinson Cancer Center
Georgetown University
GraphStream Incorporated
George Washington University
Illinois Tech
Imperial College London/UK
Internet2
Iowa State University
Ithaka S+R
Jarvis Christian University
Kansas State University
KeystoneREN
Lafayette College
Library of Congress

Link Oregon
Macalester College
Massachusetts Green High Performance Computing Center
Miami University
Middle Tennessee State University
Montclair State University
National Center for Supercomputing Applications
National Science Foundation
North Carolina State University
Nueta Hidatsa Sahnish College
NJEdge
Northwestern University
NVIDIA
New York University
Ohio Supercomputer Center
Oregon State University
Pakistan Education and Research Network
Pennsylvania State University
Princeton University
Pittsburg Supercomputing Center
Purdue University
Purdue University Fort Wayne
RENCI
Rensselaer Polytechnic Institute
Rochester Institute of Technology
Stony Brook University
State University of New York
Swarthmore College
TACC
Texas A&M University
Ohio State University
University of Texas at Austin
TIND
University of Illinois Urbana-Champaign
University of British Columbia
University of California Los Angeles
UMass Chan Medical School
University of Maryland, Baltimore
University at Buffalo
University of Arizona
University of California San Diego
University of Cincinnati
University of Colorado Boulder
University of Delaware
University of Iowa

University of Kentucky
University of Manitoba
University of Minnesota
University of Nevada Reno
University of Oklahoma
University of Pittsburgh
University of Rochester
University of Vermont
University of Wyoming
University of Southern California
University of Texas Health San Antonio
University of Virginia
University of Wisconsin Madison
World Data System
Yale University

States: 32
AL
AZ
CA
CO
CT
DC
DE
FL
IA
IL
IN
KS
KY
MA
MD
MN
NC
ND
NJ
NV
NY
OH
OK
OR
PA
TN
TX

VA
VT
WA
WI
WY

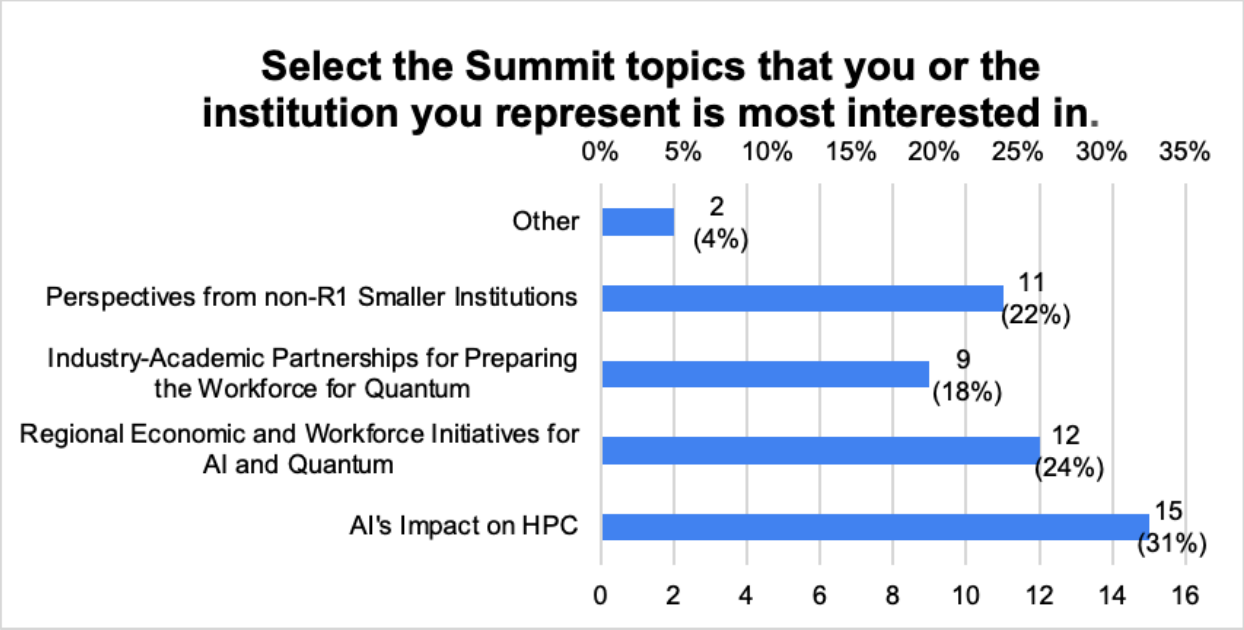
Countries
United States
Canada
Pakistan
United Kingdom

8.4.2 Post-Summit Survey Results

This section highlights the results of the post-summit survey. 23 respondents, 21% of Summit participants completed the survey.

Post-Summit Survey Results

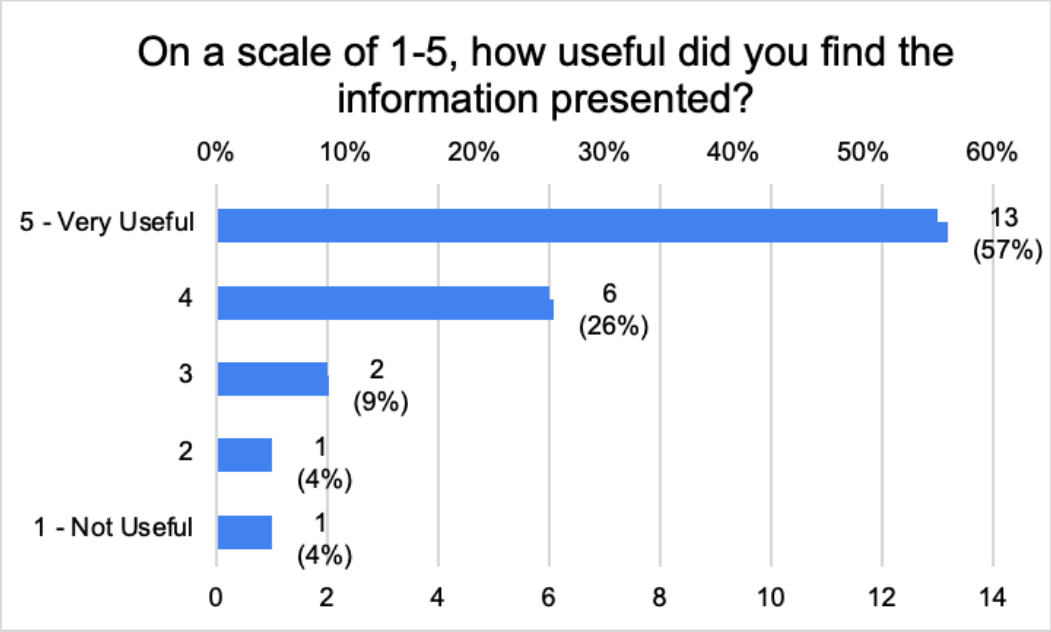
Question 1: Select the Summit topics that you or the institution you represent is most interested in.
23 responses



Other:

1. Research Computing "Champions"/facilitating/enlightenment (on state level)
2. Academic use cases for Quantum

Question 2: On a scale of 1-5, how useful did you find the information presented?
23 responses



Question 3: What are the primary reasons for your rating?
16 responses

5 - Very Useful
New information was shared
great information
Subject matter experts
keynote && insights how to work with state/politicians
Excellent content and presentations, and insightful discussions.
Panelist
Understand the concerns, ideas, and projections from major RC groups.
I am relatively new to the field, so all of the information was very helpful. I got a lot of good ideas out of the different sessions and would love to get copies of any presentations that were shared.
The summit highlighted diverse perspectives and laid important groundwork for improving AI-related platforms, enabling institutions like mine to actively participate.
Quality of speakers and the topics
4
would have liked to have heard from federal funders on these initiatives.

It would be helpful if stricter time observance could be required during panel introductions as much time was consumed with overly details or meandering contributions.
Presentation mode, number of topics, and time for questions
3
Great coverage on workforce development for Quantum, but limited information on reasons for investing in quantum or business models
I think it might have been better to have a more focused set of expectations for the sessions, whether they were small presentations or a panel.
2
1 - Not Useful
Didn't get the invite to join the meeting although registered on time.

Question 4: As we prepare our Summit report, which will include recommendations for the ERN, institutions and funding agencies, what do you think is the most important piece of information that funding agencies should take away from the Summit, and how would this impact you and/or your constituents?

13 responses

Data center growth to support AI should be a focus
Networks are critical to meeting the challenges
Partnerships are key. Community colleges, local universities, business and local, state and federal government all must come together to support these efforts so that we can stay competitive in science and the worldwide workforce.
Are our students being prepared for an AI centric economy?
.. that you are not "just" another initiative in this -- seems most here were from East coast
To continue to invest in AI and quantum education and workforce enablement, separately and together.
The takeaway is that institutions need to start identifying what workforce needs there will be for Quantum, and developing those pipelines.
Involve wider stakeholders.
there is significant resource, effort, and financial savings in shared regional computing infrastructure.
That Quantum computing would have to be hosted by large national centers that would allocate computing resources to institutions, especially smaller institutions.

Dan Stanzione observed that the AI hardware market is 10x as large as HPC ever was. While that's true by one set of definitions, I would read it a different way. The huge GPU arrays being constructed by private tech companies are in fact supercomputers, so I'd characterize the current situation by saying that the center of mass of HPC has shifted from academic/national centers funded by the entities we're used to (NSF, DoE, NASA, etc) to investor owned private companies. That means we need to find ways to get the solutions we need in an environment where we are less than 10% of the market. A good example of this, also pointed out by Dan, is that little or no semiconductor R&D is going into hardware optimized for double precision, which is still essential for much scientific work.
The most important takeaway for funding agencies is that the Summit envisions a future where AI and Quantum talent can—and should—be cultivated from all types of institutions, whether R1 or non-R1. The intentional inclusion of non-R1 institutions highlights the need to broaden the recruitment and development of talent wherever it exists, making it clear that strategic investments in these institutions are essential for building a truly diverse and resilient AI/Quantum workforce. This has a significant impact on me and my constituents. Recognition that talent exists in every corner of the academic ecosystem—and that ERN is working to level the playing field—means that our students have a real opportunity to contribute meaningfully to today's innovations and become part of the AI/Quantum workforce of tomorrow.
Funding agencies need to know that it's not enough to preferentially fund quantum or AI -- these fields, as the panelists demonstrated, rely on collaborative efforts with other fields that are under preferential threat right now.

Question 5: Please identify what aspects of the Summit were most valuable to you and why.
15 responses

Discussion on quantum challenges
Good to see the progress ern has made
I enjoyed Dan Stanzione's talk, but the regional economic and workforce initiatives were most informative. These are case studies that can be used to show that regional partnership is possible AND profitable.
speakers knowledge
Non-R1 institutions have different concerns and needs
All of them. Dan's keynote, the panels, the collaborative discussion at the end. It was good to have just a half day in a virtual format, it felt content rich and enabled people to participate as available and without the extra time and cost to travel.
Discussion of workforce skills and talent pipelines for Quantum
Personal experiences shared
being a fly-on-the-wall for the types of conversations higher level RC members are having. Looking to grow my career into this space.
The ability to join remotely was valuable in the flexibility it offered and the many highly experienced perspectives were especially illuminating on the breadth of topics. I would have liked the keynote to have had more time to tender questions live. Dan's presentation was excellent.

I am relatively new to the field, so all of the information was very helpful. I got a lot of good ideas out of the different sessions and would love to get copies of any presentations that were shared.
The keynote was informative. The panels provided different perspectives, but there were too many topics to cover.
The keynote was great, and I found the discussion of state priorities and state-center relationships particularly useful.
To me, the most valuable aspect of the summit was the focus on expanding access to advanced technologies—such as AI, Quantum, and workforce development opportunities—for non-R1 institutions. I found the discussions on the role of AI and Quantum in regional economic growth, industry-academic partnerships for workforce preparation, and insights from non-R1 institutions particularly informative. Since non-R1 institutions serve a large portion of students who need pathways into the AI/ML workforce, early inclusion is essential to ensure they are not left behind.
I appreciated gaining some connections.

Question 6: What would you recommend as the next focus area or project for the ERN and why?

14 responses

Developing interest in undergraduate students on AI and quantum
The presidents ai order
Need to hear from the students on their needs. Engage the Early Career individuals.
Building communities
work with other states (not just on the East coast) .. there should be one "thing" for this (research computing in academia)
Linking to the quantum information science education efforts going on and enabling them throughout the community.
Creating projections of use cases in academia and industry for Quantum and how to invest and sustain business models for Quantum investment.
Support research and development in AI, Quantum, and HPC
Storage. Probably as big of an issue and bottleneck to RC as AI/GPUs.
It's hard to call out one specific topic for focus since HPC has so many integral moving parts. Technological progress is so relentless, data management ever challenging, or meeting the specific needs of researchers broadly in the evolving multi-faceted environment.
Research data management and movement
What's on everyone's minds right now is the federal drama. The tendency is to say nobody knows, there is too much uncertainty, etc., but it's a challenge for everyone, and the point of the network is to share stories, success and failure, so that others can learn and benefit.

I recommend that the next focus area for the ERN should be fostering stronger engagement with leaders from both industry and academic administration. Including individuals in key decision-making roles in these sectors would ensure that the ideas and innovations proposed by researchers, scientists, and faculty are not overlooked. By involving stakeholders with the authority to act on these proposals, the ERN can help bridge the gap between vision and implementation, leading to more impactful outcomes.
Increased focus on regional collaborations around quantum and AI

Question 7: Please add any final comments you wish to share with the ERN Steering Committee.
9 responses

Great job and thanks for your hard work
This was my first interaction with ERN. Thank you for the excellent Summit. I look forward to engaging further.
great program
Thank you !!!
Great job Forough and Maureen organizing and implementing!! You made the event and preparation look very smooth, like a swan gently gliding over water, while we know you were actively pushing and steering from underneath. Thank you for your grace and efforts. Onward!
Thanks. It is a wonderful experience.
The summit was great opportunity to engage with the ERN community and the effort in delivering it much appreciated. Thank you. I will certainly look to join again in the future.
This was very well organized, thanks!
I gained a lot from the summit. The open and inclusive nature of the ERN Summit made it especially valuable, as it welcomed participants from diverse backgrounds and varying levels of involvement in AI and advanced technologies. This is the recipe for a rich environment for learning, networking, and collaboration. I appreciated the opportunity to hear from voices across sectors as they engaged in thoughtful discussions about the role of AI, Quantum, and cyberinfrastructure in shaping workforce development and regional innovation and their accessibility for non-R1 institutions. Thank you for organizing such a meaningful and accessible event.

Question 8: What are your thoughts on the challenges and opportunities regarding implementing AI and/or Quantum?
15 responses

Collaboration is needed to break to the next level
Lots of unknowns
We have a long way to go. I have found that locally, I have to educate people what quantum is and why it can benefit them. Need a more robust campaign on the basics and how this fits into "small town America".

where will we be in 3 years
Developing an AI literate workforce
just a tool --- do not over promise and under-deliver (aka AI winter that was here until recently) .. focus on research computing as the umbrella of it all ;)
We can learn from each other and plan the future.
Challenges in AI are identifying sustainable business models. For Quantum, it is identifying what it is good for, and when to consider it 'ready for prime time'/
Workforce development
That there might need to be a federal shift in STEM funding from the researcher level to the regional computational level.
Quantum is not on the radar at our institution's scale beyond observing current developments. AI on the other hand is well and truly impacting day to day operations now in various ways, whether through project related workloads or course delivery influences.
1. Higher education needs to tell its story better - it is clear that research in HE was key to where the industry currently stands - and no one talks about this> 2. The changes in hardware and software sound like they will be profound - will HE be able to stay abreast these changes with the funding challenges? 3. the industry does not need graduate students - how would the industry connect with regional, small institutions to make sure they know about these opportunities?
AI is a rapidly developing technology and it is challenging to keep up and deploy solutions at the same time. Quantum computing is not yet sought by many researchers
AI implementation poses challenges for smaller universities due to limited training and computational resources. However, initiatives like ERN offer promising opportunities by bridging these gaps. The key challenge lies in aligning resource providers and recipients to ensure effective knowledge transfer and sustainable adoption.
#1 challenge right now is the existential threat to science posed by the administration's attempted cuts to science funding.

8.4.3 Post-Summit Feedback by Email