NVIDIA Announces Collaboration With IBM and Fermi National Accelerator Laboratory to Launch Quantum-Classical Codesign Platform, Plus Error-Correction Breakthrough to Advance Practical Quantum Computing

IBM and NVIDIA Work With Fermilab in Developing Modular Architectures for Scalable Quantum Computers — Separately, Breakthrough NVIDIA CUDA-Q Algorithm Delivers up to 13,000x Faster Decoding for Error-Correction Research

News Summary:

- NVIDIA and IBM announce a growing quantum supercomputing collaboration combining NVIDIA accelerated computing and software with IBM quantum computers to advance quantum error-correction research, scientific applications and integration into supercomputing workflows. NVIDIA DGX B200 systems will connect with IBM quantum computers, including those powered by IBM Quantum Nighthawk, the most powerful processor IBM has yet built.
- A quantum computing codesign platform with Fermi National Accelerator Laboratory, alongside IBM and NVIDIA, will support quantum error-correction and applications research for future systems.
- NVIDIA releases TCBP-JOBS, a new decoding algorithm part of the CUDA-Q platform, that delivers up to a 13,000x speedup for quantum error-correction research, accelerating fault-tolerant quantum computation.
- NVIDIA is expanding Slurm to simplify scheduling quantum processors within supercomputing workflows, with IBM contributing integration through its Quantum Resource Management Interface.

NVIDIA today announced plans for new collaborations with IBM and the U.S. Department of Energy's Fermi National Accelerator Laboratory that will span research into next-generation modular architectures for quantum computers, scientific applications and supercomputing integration. These efforts, including a new modular quantum computing codesign platform with IBM and Fermilab, combine NVIDIA accelerated computing and software with IBM quantum computers to help researchers scale quantum computers and explore their scientific capabilities.

Separately, NVIDIA also announced a new quantum algorithm that delivers up to 13,000x faster decoding compared with existing leading algorithms -- cutting the computation time for researching new quantum computing designs from 12 weeks to just 45 minutes.

The collaboration with IBM also brings together new Slurm capabilities integrations to simplify how quantum computers can be added into supercomputing workflows.

Modular Quantum Computing Codesign Platform
IBM and NVIDIA are colocating NVIDIA DGX™ B200 systems with state-of-the-art IBM quantum computers, including those powered by IBM Quantum Nighthawk, the fastest quantum processor IBM has ever delivered. This integrated system is supporting a jointly developed IBM, Fermilab and NVIDIA modular quantum codesign platform.

The codesign platform will allow researchers to develop and evaluate error-correction codes, decoding algorithms and quantum-classical applications driving scientific discoveries in high-energy and nuclear physics (HENP), as well as how classical systems can scale alongside multiple linked quantum processors within modular architectures.

Fermilab's expertise will allow work at the platform to focus on quantum error correction and HENP applications -- helping define requirements for future fault-tolerant quantum computers and the science that can be achieved with them.

“Making quantum computers useful for science requires advances in error correction, applications and the systems that bring quantum processors and accelerated computing together," said Krysta Svore, vice president of applied research for quantum computing at NVIDIA. “NVIDIA's research software and our collaboration with IBM give scientists more powerful tools to investigate quantum designs and develop applications across these systems."

“Some of the most fundamental problems in science remain out of reach without access to quantum computing. Scaling quantum and classical together will open new frontiers in high-energy and nuclear physics and beyond," said Jerry Chow, IBM Fellow and chief technology officer of quantum-centric computing. “With Fermilab and NVIDIA, we plan to explore how these real-world problems can help us shape the modular, interconnected architectures that will define the next generation of quantum computers and accelerated classical computing."

“The future of quantum computing depends on more than advances in quantum hardware alone," said Anna Grassellino,

Fermilab chief technology officer and director of the SQMS Center. “Accelerated computing and superintelligence will play an important role in how we design algorithms, study errors and coordinate increasingly complex quantum systems. This proposed platform would combine NVIDIA's computing capabilities with IBM's quantum technologies and Fermilab's scientific expertise, and would enable researchers to explore new approaches to codesigning quantum computers that meet the needs of challenging HENP science problems."

Advancing Quantum Error-Correction Research
Errors inherent to quantum processors limit the complexity and duration of the computations they can perform. Quantum error correction protects quantum information by encoding it across multiple physical qubits. A classical algorithm called a decoder interprets measurement data to identify likely errors so they can be corrected.

Available through the NVIDIA CUDA-Q™ QEC 0.9.0 library today, NVIDIA's new TCBP-JOBS decoding algorithm accelerates the computationally intensive parts of quantum error-correction research by up to 13,000x while delivering high accuracy. Faster decoding in research workloads allows scientists to evaluate candidate error-correction approaches more efficiently and explore how different codes and decoder configurations perform.

The new decoding algorithm provides researchers with tools to identify designs that use physical qubits more efficiently, and better measure their performance improvements, shortening the path to practical fault-tolerant quantum computing.

Advancing Quantum Chemistry
IBM and RIKEN are advancing quantum-classical chemistry research powered by NVIDIA accelerated computing. The work, which combines IBM's quantum computer with RIKEN's JHPC-quantum GPU supercomputer ROQUO, has been named a finalist for the 2026 ACM Gordon Bell Prize.

The researchers calculated binding energies for two protein-ligand complexes to study interactions relevant to drug discovery. By dividing the systems into fragments and combining quantum sampling with GPU-accelerated calculations, they modeled complexes containing up to 12,635 atoms -- more than 40x the size of the previous 303-atom quantum-classical benchmark.

ROQUO uses NVIDIA GB200 systems and NVIDIA Quantum-X800 InfiniBand networking to support research in quantum algorithms, simulation and hybrid computing.

This research is supported by NEDO (New Energy and Industrial Technology Development Organization), an organization under the jurisdiction of Japan's Ministry of Economy, Trade and Industry's “Research and Development of Quantum-Supercomputers Hybrid Platform for Exploration of Uncharted Computable Capabilities."

Bringing Quantum Into Supercomputing Workflows
NVIDIA is expanding the open source Slurm workload manager with a quantum interface that simplifies integrating quantum processors into supercomputing environments. IBM is contributing to the integration through its Quantum Resource Management Interface, connecting IBM quantum resources to the new Slurm capabilities.

Supercomputing centers rely on a variety of custom approaches to integrate quantum hardware, creating additional engineering and maintenance work as centers add quantum processors and develop hybrid applications.

The new Slurm capabilities will allow centers and researchers to schedule quantum processors alongside CPUs and GPUs using familiar commands, policies and tools.

Learn more about NVIDIA technologies for quantum computing.

About NVIDIA
NVIDIA (NASDAQ: NVDA) is the world leader in AI and accelerated computing.

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Corporate Communications
NVIDIA Corporation
press@nvidia.com