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HIGHLIGHTING NEWS

IBM UNVEILS ITS MOST ADVANCED QUANTUM COMPUTER IN CHICAGO

Quantum computing is taking another step toward practical applications as IBM has unveiled its first quantum computer in Illinois. On November 6, 2026, IBM, the University of Chicago, and the State of Illinois announced the deployment of IBM Quantum System Two at Hyde Park Labs in Chicago. Powered by IBM's latest Nighthawk processor, the system aims to accelerate quantum research and strengthen collaboration among academia, industry, and national laboratories.

At the heart of the system is IBM Quantum Nighthawk, a superconducting quantum processor featuring 120 programmable qubits connected through 218 tunable couplers in a square-lattice architecture. Its increased connectivity allows more complex quantum circuits to be executed with fewer routing operations. The latest Nighthawk r2 processor also introduces high-speed independent qubit reset, enabling more than 100,000 circuits per second—up to 25 times the throughput of IBM's previous Heron processor while maintaining comparable gate fidelity.

The new quantum computer will serve as a central resource for the National Quantum Algorithm Center (NQAC), an initiative established in 2024 to advance quantum algorithms and applications. Through collaborations involving IBM, Deloitte, AbbVie, and Northwestern University, researchers are exploring quantum molecular simulation for drug discovery. Other projects involving the Electric Power Research Institute and the University of Illinois Urbana-Champaign investigate quantum optimization for more efficient electrical power grids.

The deployment also strengthens Chicago's growing quantum ecosystem by connecting universities, startups, national laboratories, and industrial partners. The University of Chicago will initially host the system before its planned relocation to the Illinois Quantum and Microelectronics Park, where it will support longer-term research and technology development.

While practical quantum advantage remains an active research challenge, the arrival of IBM Quantum System Two provides researchers with access to advanced quantum hardware and an environment for developing and validating increasingly complex algorithms. By bringing together hardware innovation, scientific research, and industrial applications, the initiative represents another step toward useful quantum computing.

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NVIDIA RESEARCHERS DEVELOP AI-AGENT PIPELINE FOR QUANTUM ERROR CORRECTION HARDWARE

Building reliable quantum computers requires more than designing quantum error-correcting codes—it also requires ensuring that physical hardware can reproduce the interactions those codes demand. Researchers from NVIDIA have introduced an AI-agent-assisted workflow that connects theoretical topological quantum codes to superconducting quantum hardware, combining automated circuit design, numerical simulation, and formal mathematical verification using the Lean theorem prover.

The central challenge is that physical quantum devices generate both desired interactions and unwanted couplings that may disturb the protected quantum states. To address this, the researchers developed a pipeline that starts from a target error-correcting code, constructs its Hamiltonian, and determines the energy gap separating the encoded states from unwanted excitations. AI agents then search for suitable hardware parameters and evaluate whether the resulting device Hamiltonian preserves the intended code space.

The workflow uses OpenAI Codex agents to assist with mathematical derivations, numerical simulations, parameter optimization, and Lean proof generation, while human researchers define the scientific requirements and review the results. Lean independently checks whether the mathematical conclusions follow from the specified assumptions, providing a formal verification layer beyond conventional AI-generated scientific reasoning.

To demonstrate the approach, the researchers simulated an eight-qubit toric code implemented using driven superconducting SQUID couplers. The agent-guided search explored 165 hardware configurations and analyzed 8,561 unwanted Pauli interaction channels. By grouping anticommuting interactions, the researchers obtained tighter mathematical bounds on unwanted effects than conventional methods that simply sum individual interaction strengths.

The resulting model was formally verified to preserve four isolated low-energy states corresponding to the intended toric-code space. Numerical analysis found a subspace deviation of 0.054, below the theoretical upper bound of 0.279. The workflow also identified a dominant unwanted two-qubit ZZ coupling of approximately 27.8 kHz, offering a specific target for future hardware optimization.

Although the results are based on simulated device models rather than an experimental quantum processor, the approach demonstrates how AI agents and formal verification can work together to improve quantum hardware design. By connecting theoretical code requirements to verifiable physical implementations, the framework could help accelerate the development of more reliable quantum computing architectures.

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