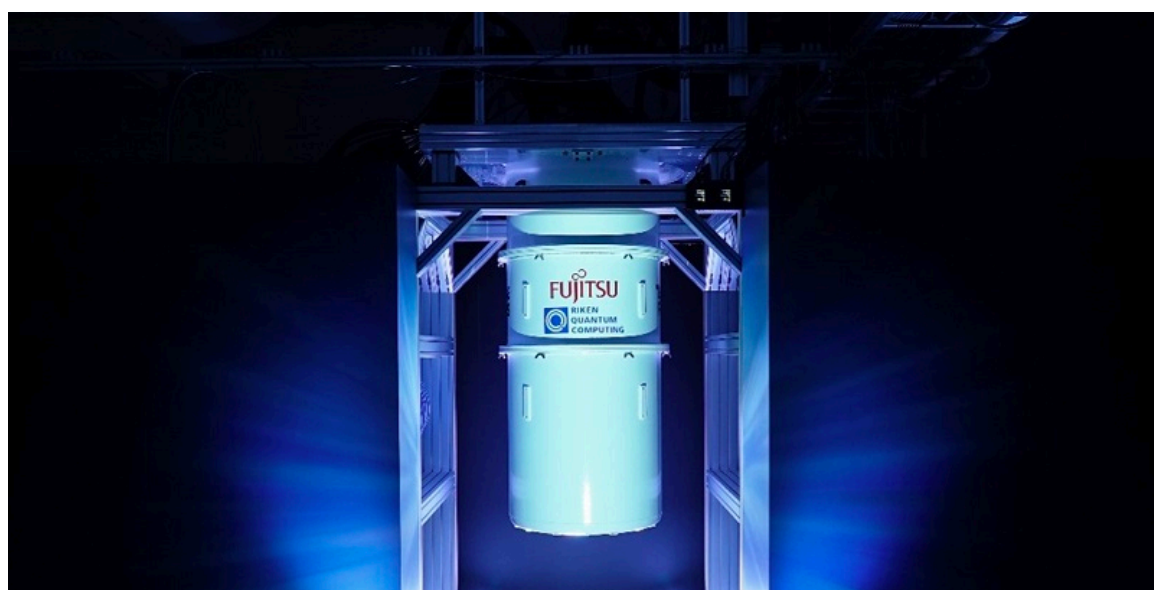


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## SELECTED NEWS

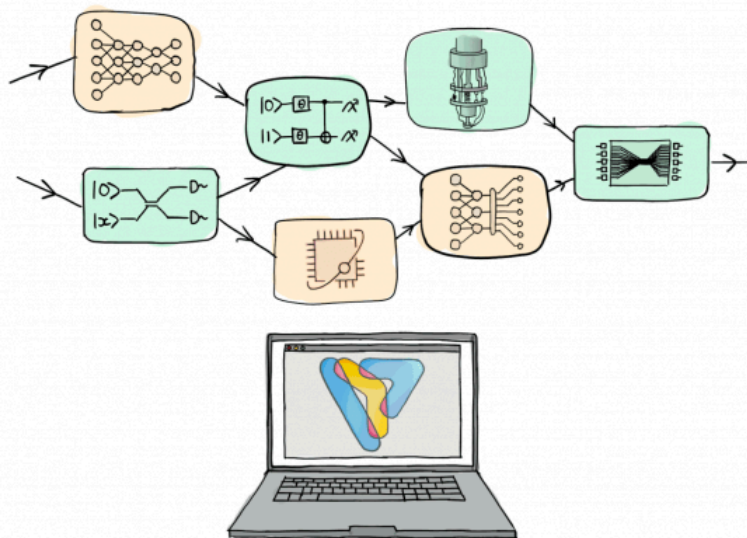
### Fujitsu and Riken jointly develop Japan's second quantum computer



Fujitsu and RIKEN have successfully developed a 64-qubit superconducting quantum computer for quantum chemistry and financial algorithm research. This development is further complemented by a hybrid quantum computing platform that pairs this new quantum computer with Fujitsu's 40-qubit quantum computer simulator. Additionally, new hybrid quantum algorithms have been created, which outperform traditional algorithms in accuracy. With future ambitions set on developing a thousand-qubit superconducting quantum computer and enhancing quantum gate operations, the aim is to provide resources for sectors like finance and drug development. This entire effort is geared towards hastening the practical implementation of quantum computing.

The newly unveiled 64-qubit computer builds upon the technology of Japan's inaugural superconducting quantum computer revealed in March 2023. This high-precision quantum gate operation system holds the promise of scaling computations beyond the reach of classical computers. By merging quantum computers with high-performance computing, the developed hybrid quantum algorithms achieve enhanced accuracy in quantum chemistry calculations. The overarching objective is to usher in practical, fault-tolerant quantum computers, given the noise susceptibility in current NISQ systems. Furthermore, collaborations will be fortified to delve into hybrid quantum applications across diverse sectors.

# A Quantum Boost: cuQuantum With PennyLane Lets Simulations Ride Supercomputers



Xanadu and Nvidia have joined forces to enhance quantum simulations with the PennyLane library and cuQuantum SDK. Utilizing 256 Nvidia A100 GPUs, they've pioneered quantum simulations at a supercomputer level, achieving simulations for up to 36 qubits. PennyLane, Xanadu's creation, integrates quantum and classical computation, leveraging quantum features for machine learning. Nvidia's cuQuantum SDK, in synergy with their GPU capabilities, optimizes large quantum system simulations. A standout feature of PennyLane is its incorporation of machine learning into quantum computing, although simulating larger quantum systems presents memory challenges. In 2022, the use of cuQuantum on single GPUs led to a tenfold speed surge. Memory management remains paramount, especially with the limitations posed by the state vector capacities of GPUs. To counter this, Xanadu introduced MPI technology and Nvidia's cuQuantum SDK into PennyLane, enabling larger-scale simulations, as demonstrated on NERSC's Perlmutter supercomputer.

計畫補助單位



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