Xanadu breakthrough lowers the cost of quantum applications

May 21, 2026

TORONTO, May 21, 2026 /PRNewswire/ - Xanadu Quantum Technologies Limited ("Xanadu") (Nasdaq: XNDU) (TSX: XNDU) today announced an algorithmic breakthrough in Quantum Read-Only Memory (QROM), a vital component for executing advanced quantum applications. This new implementation is expected to reduce the number of expensive quantum operations by approximately twofold, directly overcoming a significant hardware bottleneck that challenges near-term, utility-scale fault-tolerant quantum computers.

QROM is an algorithmic subroutine for loading classical data onto a quantum computer, and constitutes a major bottleneck for applications of quantum computers. Despite its critical importance, QROM performance had reached a plateau, with no significant improvements to the previous state-of-the-art over the last seven years. Xanadu's recent work breaks this dry spell by delivering an advancement that lowers the resource requirements for quantum applications.

The innovation specifically targets reducing the number of Toffoli gates, one of the most computationally expensive operations a quantum computer can perform. For problem sizes limited by the number of available qubits, Xanadu's implementation approximately halves the Toffoli gate count within QROM modules.

These optimizations provide cost reductions by replacing traditional qubit "swapping" methods with a "copying" mechanism for QROM. In addition to this, the new work further optimizes common sequencing of back-to-back QROM modules by removing multiple redundant data-unloading steps and replacing them with a single, efficient unloading process. Together, these two innovations allow quantum programs to load classical data through QROM at roughly half of the previous cost.

"Our team focuses on making quantum computing practical for real-world use. To reach that goal, we must find innovative ways to improve efficiency within the quantum computing stack," said Dr. Christian Weedbrook, Xanadu Founder and Chief Executive Officer. "By halving QROM costs, we are using quantum algorithm developments to reduce the cost of quantum computation for many applications, accelerating the timeline towards practical quantum computing and enabling more complex computations on near-term hardware."

This advancement offers immediate benefits for near-term utility-scale quantum computers, where making use of the limited number of available qubits is crucial to enabling industry use cases. This work marks another milestone in accelerating Xanadu towards achieving its mission: to build quantum computers that are useful and available to people everywhere.

About Xanadu

Founded in 2016, Xanadu is a Canadian photonic quantum computing company with the mission to build quantum computers that are useful and available to people everywhere. Xanadu is building fault-tolerant quantum computers using light, with systems designed to compute at room temperature. Backed by more than $500 million USD in funding, Xanadu develops both hardware and software, including PennyLane, its open-source quantum computing platform. Xanadu is the first pure-play photonic quantum computing company to list on public markets (Nasdaq/TSX: XNDU) and is recognized globally for its breakthroughs in scalable quantum technologies. Visit xanadu.ai or follow on X @XanaduAI.

View original content:https://www.prnewswire.com/news-releases/xanadu-breakthrough-lowers-the-cost-of-quantum-applications-302778615.html

SOURCE Xanadu

Press contact: press@xanadu.ai; Investor relations: investors@xanadu.ai