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GOOGLE XPRIZE COMPETITION OFFERS 5 MILLION PRIZE

Source: xprize.rg

Google is sponsoring an XPRIZE competition, offering a $5 million prize to encourage researchers to develop quantum applications that can solve real-world problems.The event, named the XPRIZE Quantum Application Challenge, is organized jointly by Google Quantum AI, Google.org, and the research institution GESDA (Geneva Science and Diplomacy Anticipator), with a planned duration of three years. The $5 million reward aims to incentivize the development of quantum computing algorithms that can be practically used in the real world.

Ryan Babbush, the head of Google Quantum AI, points out that most of the quantum algorithms developed in academia today are focused on solving abstract mathematical problems and are less applied in real-world scenarios. The utility and optimal applications of quantum computing in the real world are still unclear. The goal of Google Quantum AI, with its large-scale error-corrected quantum computers and the development of practical quantum applications, aligns with the purpose of the XPRIZE Quantum Application competition—to address these challenges. The competition aims to foster applications for NISQ (Noisy Intermediate Scale Quantum) processors, which lack fault tolerance, as well as applications for future large-scale fault-tolerant quantum computers. The organizers hope to identify these applications before the widespread availability of large-scale quantum computers, facilitating a faster deployment once the hardware is ready.

Teams interested in participating must first describe the problem their proposed application aims to solve and analyze how long their algorithm would take to run on a quantum computer. Twenty teams will be selected to advance to the semifinals, where each team must detail the hardware specifications needed to run their algorithm and demonstrate its superiority in terms of speed, accuracy, and expected performance after deployment on traditional computers.

As for the prize distribution, semifinalist teams will each receive a $50,000 prize. Out of the $5 million prize pool, three winning teams will collectively receive $3 million, while the subsequent five teams will share a $1 million prize.

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TWO-DIMENSIONAL TWEEZER ARRAY WITH MORE THAN 1000 ATOMIC QUBITS

Optical tweezer-based quantum processors, formed by precision laser beams in two-dimensional arrays, stand out as a highly promising technology for advancing quantum computing and simulation, paving the way for a multitude of applications. Ranging from drug development to traffic optimization, these processors have demonstrated their potential by accommodating several hundred single-atom quantum systems, each serving as a quantum bit (qubit), the fundamental unit of quantum information. To propel the field forward, increasing the qubit count is imperative, a milestone achieved by Professor Gerhard Birkl's team at the "Atoms -- Photons -- Quanta" research group in the Department of Physics at TU Darmstadt.

In their groundbreaking research, initially shared on the arXiv preprint server in October 2023 and later published in the journal OPTICA after rigorous scientific peer review, the team details the world's inaugural experiment realizing a quantum-processing architecture featuring over 1,000 atomic qubits within a single plane.

The breakthrough comes from the introduction of "quantum bit supercharging," a novel method that circumvents restrictions imposed by laser performance, enabling the loading of 1,305 single-atom qubits into a quantum array with 3,000 trap sites. Reassembling these qubits into defect-free structures with up to 441 qubits, the researchers deploy multiple laser sources in parallel, overcoming previously perceived technological barriers.

The research underscores the threshold significance of 1,000 qubits for showcasing the efficiency boost promised by quantum computers across various applications. Professor Birkl's group achieves a global first in breaking this threshold for atomic qubits, and their published work outlines how the integration of additional laser sources could lead to qubit numbers exceeding 10,000 within a few years. This achievement marks a pivotal step towards realizing the transformative potential of quantum computing on a broader scale.

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