**Two world’s Biggest Quantum Computers Made in China**

Name

Institutional Affiliation

Course

Professor

Date

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Quantum computing is an area of computer science that focuses on developing computer technology based on the notions of quantum theory (which explains the behavior of energy and material on the atomic and subatomic levels). Computers nowadays can only encode data in bits with 1 or 0, severely limiting their capabilities.

**Customer requirements for these computers**

1. **Great enough complexity example enough components known as quantum bits or "qubits."**

Quantum bit could, in theory, achieve the quantum advantage allowing it to find solutions to problems no other computer could ever solve. A quantum bit is a basic unit of quantum information. Qubits can hold up to two bits of data.

Qubits are implemented in various physical forms, including the polarization of a photon, two of an ion's (many) discrete energy levels, a superconducting Transmon qubit, the nuclear spin states of an atom, and the spin states of an electron are just a few examples (Marinescu & Marinescu, 2012). Quantum Inspire is a program that allows you to control various qubit technologies. Its modular design allows it to reuse innovative components while replacing technology-dependent parts (software and hardware).

1. **Achieving quantum advantage**

Quantum advantage means that a computer can perform its computation faster and better than a classical computer. In some cases, it can perform calculations that a classic computer cannot achieve. A good example is the Big O notation of a quantum computer is much smaller than the Big O notation of the classic computer.

1. **Performing calculations in an instant.**

Quantum computers perform calculations depending on the probability of an object's state before it is measured to perform more computations than classic computers (ScienceAlert Staff, 2021). Quantum operations use the quantum state of an object to produce a qubit.

Unmeasured quantum states exist in a mixed ‘superposition' rather than having a definite position, much like a coin spinning through the air before landing in your hand.

These superpositions can get entangled with those of other objects, implying that their outputs will be mathematically connected, even though we have no idea what they are yet.

The complicated mathematics underpinning these unsettled states of entangled 'spinning coins' may be input into unique algorithms to solve problems that would take a traditional computer a long time to solve... if they could ever solve them at all.

1. **Showing faster results**

Quantum computers, according to physicists, could one day execute revolutionary algorithms that could, for example, scan vast databases or factor large numbers — including encryption methods.

Google has revealed that it has a quantum computer in its lab 100 million times faster than any classical computer.

They generate 2.5 exabytes of data per day, the same amount of data as 5 million laptops. In the age of big data, quantum computers will allow us to process the massive amounts of data we're producing.

As a demonstration of quantum supremacy, sampling from the output distribution of random quantum circuits is done. Prior findings are extended in computational complexity to argue that this sampling process must require exponential time in a classical computer.

**References**

Marinescu, D. C., & Marinescu, G. M. (2012). Physical realization of quantum information processing systems. *Classical and Quantum Information*, 563-649. <https://doi.org/10.1016/b978-0-12-383874-2.00006-0>

ScienceAlert Staff. (2021, December 8). *How do quantum computers work?* ScienceAlert. <https://www.sciencealert.com/quantum-computers>