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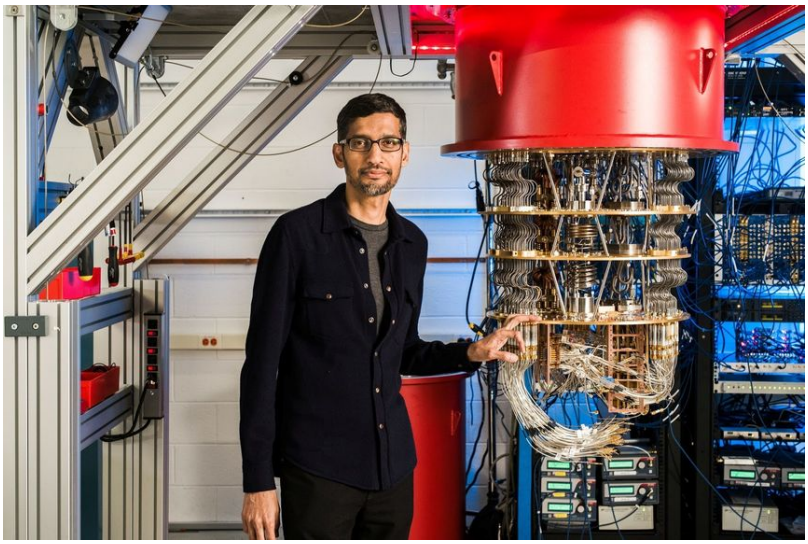
Google Claims Breakthrough in Quantum Computing

Others, including IBM, dispute the science behind Google's 'quantum supremacy'



Google CEO Sundar Pichai with one of the company's Quantum Computers in its Santa Barbara lab. PHOTO: HANDOUT/REUTERS

By Sara Castellanos

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Alphabet Inc. 's Google said its quantum computer has performed a calculation in about three minutes, compared with the 10,000 years it would have taken the world's fastest conventional supercomputer.

The calculation involves a progressively difficult random number-sampling task and the research was published Wednesday in the science journal Nature.

The search giant claims to have achieved so-called quantum supremacy, which Google defines as a programmable quantum computer performing a task so demanding that in practical terms it would be impossible for a regular computer. The quantum processor collected one million samples of a quantum circuit in approximately 200 seconds, which would have taken a state-of-the-art supercomputer an estimated 10,000 years.

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Industry experts and competitors have defined that term differently. International Business Machines Corp., for example, argues that the term refers to the threshold where quantum computers can perform calculations that classical computers can't do at all.

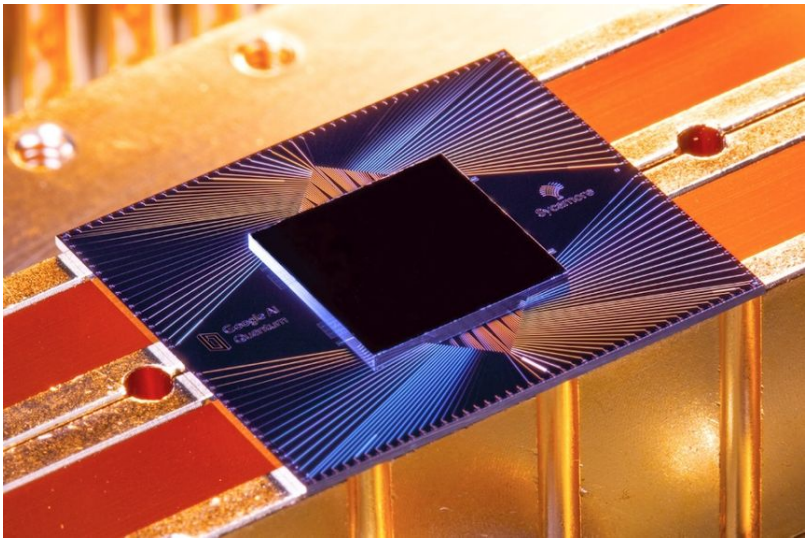
IBM, which is working to commercialize its own quantum computer, saw a version of the Nature paper prior to publication and published a blog post earlier this week disagreeing with the science behind Google's claim. The calculation could have been solved with a classical machine in 2½ days instead of 10,000 years, IBM said.

Experts say quantum computing can be orders of magnitude more powerful than traditional computers.

By harnessing the properties of quantum physics, quantum computers have the potential to sort through a vast number of possibilities in nearly real time and come up with a probable solution. While traditional computers store information as either 0s or 1s, quantum computers use quantum bits, or qubits, which represent and store information as both zeros and ones simultaneously.

Google's quantum computer is a 54-qubit processor named Sycamore.

Experts say quantum computing can be applied across industries, including pharmaceuticals, finance and transportation. Companies including JPMorgan Chase & Co. and Volkswagen AG have been experimenting with early versions of quantum computers.



Google's Sycamore processor. PHOTO: ERIK LUCERO / GOOGLE

Google's demonstration of quantum computing's processing power comes as competitors such as Microsoft Corp. and IBM, and venture capital-backed startups, are working to commercialize the technology using various methods.

President Trump's administration has made quantum computing a priority and authorized the spending of $1.2 billion over five years for quantum-related activities across the federal government.

Google's quantum researchers have been working for years to solve two major technical problems to commercialize quantum computing. One is that qubits can't yet maintain their quantum mechanical state for more than a fraction of a second, in part because they are delicate and easily disrupted by changes in temperature, noise or frequency.

Another challenge is that current quantum-computing systems don't have fault tolerance like traditional computers, meaning if the delicate qubits are disturbed they can't resume or continue running the program they were handling.

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