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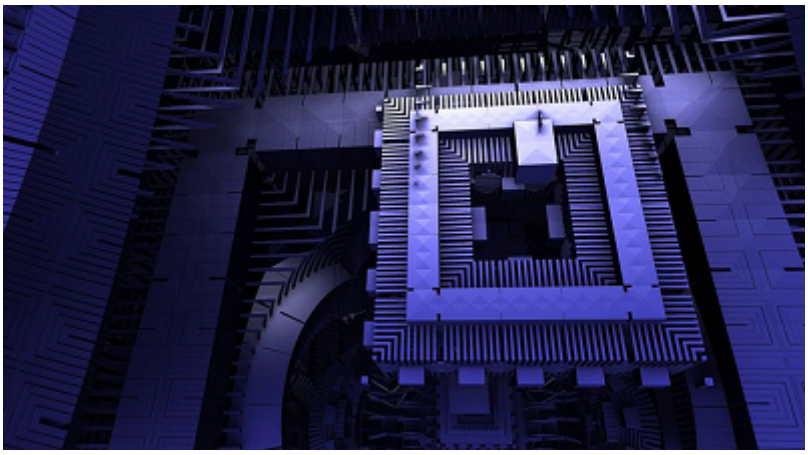
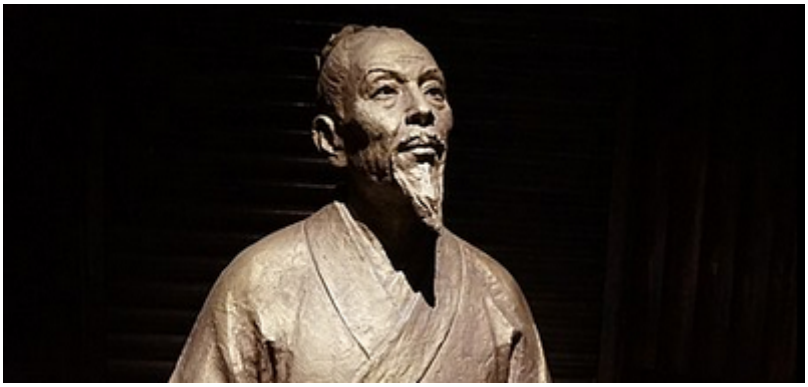
Zuchongzhi?



What's Zuchongzhi? It's the quick quantum processor that's in development. Recently, it has been getting some media attention and for a good reason. Are you wondering why this particular name was chosen for the processor?



Our best guess? It sounds similar to Zu Chongzhi; the Chinese astronomer, mathematician, politician, inventor and writer. He lived during the Liu Song and Southern Qi dynasties. He is probably best known for his astonishingly accurate calculation of pi, somewhere between 3.1415926 and 3.1415927. This calculation was a record in accuracy. It went unsurpassed for 800 years.

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How does the speed of the Zuchongzhi processor measure up against other processors? If processors were racehorses, it would be not much unlike Secretariat's amazing performance against the competition during the famous 1973 race at Belmont. Horseracing historians can appreciate the comparison. Secretariat was a very fast horse not much unlike the Zuchongzhi processor.

Some people might find this subject boring; that's ok. It's not for everyone. Other people however find tech talk intriguing! Wondering how quantum computers are capable of exceeding the speed of traditional computers?

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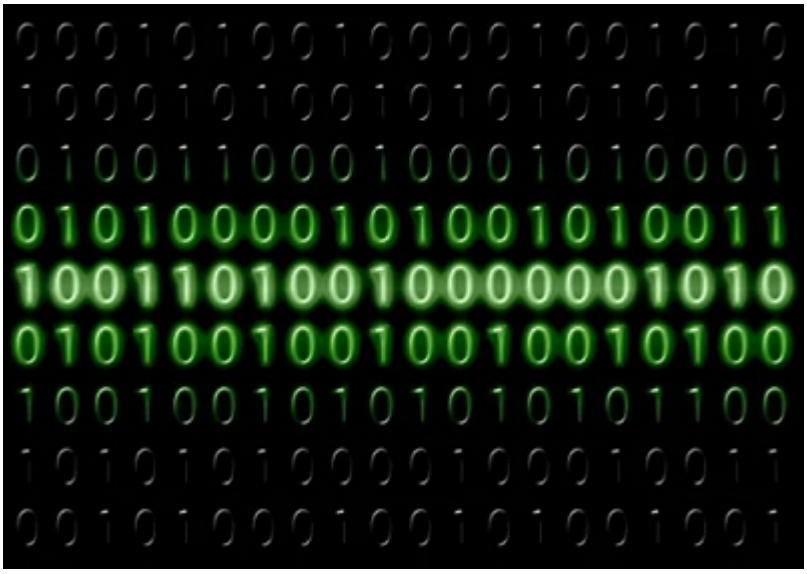

Curious? A bit! Essentially, bits are what limit a traditional computer's speed. Quantum computers perform calculations faster without speed constraints that bits pose. They use quantum bits, or qubits, instead of using binary bits.

The team of Researchers actually made this superconducting quantum processor with a capacity 66 functional qubits. When faced with a complex sampling task, this quantum processor surpassed even the most powerful supercomputers. The task was completed in a fraction of the time that it would take a supercomputer. Some contend this achievement is a giant step towards quantum primacy also known as quantum supremacy or quantum advantage. What does this mean? The short answer: This is the point in time when quantum computers makes traditional computers seem antiquated.

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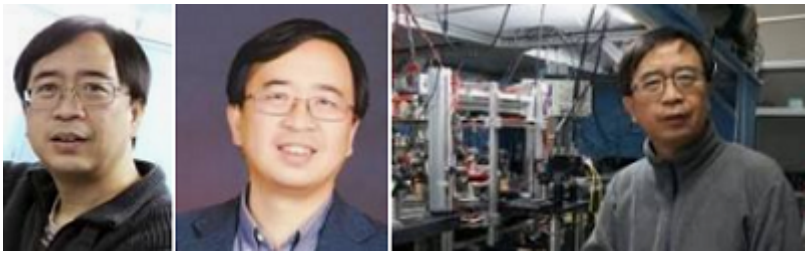

Who deserves credit for this achievement? Jian-Wei Pan's team at the University of Science and Technology of China were the ones who made the superconducting processor and the alternative system that uses photonics.

How was it achieved? The computational task involves sampling problems whose solutions weren't singular but multiple random samples along a probability distribution. The vast potential outputs made it possible for the team to pose a sampling problem, which was beyond the feasibility of a conventional computer, though within the range of feasibility of a quantum computer. How exactly was a viable system created? Using a processor that needed more qubits than possible. How many qubits? Around 50 qubits.

The Zuchongzhi tunable superconducting processor was capable of achieving this requirement with 66 functional qubits. A complex sampling problem, which presented about 2-3 times more demanding than previous problems, was assigned to the Zuchongzhi quantum processor. It finished in 1.2 hours, which is incredibly fast especially when compared with traditional computers.

Even a supercomputer would require about 8 years to solve the same problem and researchers only utilized 56 qubits for the sampling problem, which is 3 qubits more than Google's prior primacy claim. This is not a particularly large increase. Nevertheless, one must consider the additional computational power to complete for conventional computers at this level.

Primacy claims may be met with skepticism amongst certain circles. Critics are likely to contend that ideal algorithms for the job are not used when conventional computers are pitted against the quantum options. True. But with such an increase over previous claims, the hope is to settle the debate.

Regarding the sampling problem, it appears quantum computers are significantly faster than the conventional computers. But they're impractical prior to further innovation. It will take time before quantum computers are used

for everyday tasks. Though, it doesn't necessarily mean that quantum processors aren’t currently useful for a few uncommon computational tasks.

This is the beginning of a new technological frontier in quantum computing. Future applications of the Zuchongzhi quantum processor? Only time will tell. Meanwhile, just imagine the possibilities. It is certainly something to process!

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