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QUATUM COMPUTERS

Google, IBM and a handful of startups are racing to create the next generation of supercomputers. Quantum computers, if they ever get started, will help us solve problems, like modeling complex chemical processes that our existing computers cannot even scratch the surface of. At the moment, companies and researchers are using a handful of different approaches to try and build the most powerful computers the world has ever seen.

So, the **aim** of our research is to present the notion of a quantum computer and the perspectives of its functioning.

As the researchers predict the quantum future isn't going to come easily, and there's no one knowing what it'll look like when it does arrive [1].

Quantum computing takes advantage of the strange ability of subatomic particles to exist in more than one state at any time. Due to the way the tiniest of particles behave, operations can be done much more quickly and use less energy than classical computers.

In classical computing, a bit is a single piece of information that can exist in two states – 1 or 0. Quantum computing uses quantum bits, or 'qubits' instead. These are quantum systems with two states. However, unlike a usual bit, they can store much more information than just 1 or 0, because they can exist in any superposition of these values. This means a computer using these bits can store a huge amount more information using less energy than a classical computer.

Until recently, it seemed like Google was leading the pack when it came to creating a quantum computer that could surpass the abilities of conventional computers. In a *Nature* article published in March 2017, the search giant set out ambitious plans to commercialize quantum technology in the next five years. Shortly after that, Google said it intended to achieve something, which is called 'quantum supremacy' with a 49-qubit computer by the end of 2017.

In November 2017, Google announced it had built a 50-qubit quantum computer. Where IBM has gone further than Google is making quantum computers commercially available. Since 2016, it has offered researchers the chance to run experiments on a five-qubit quantum computer via the cloud and at the end of 2017 started making its 20-qubit system available online too [3].

Californian startup Rigetti is focusing on the stability of its own systems rather than just the number of qubits and it could be the first to build a quantum computer that people can actually use [1].

Quantum computers operate on completely different principles to existing computers, which makes them really well suited to solving particular mathematical problems, like finding very large prime numbers [2].

Researchers are also excited about the prospect of using quantum computers to model complicated chemical reactions, a task that conventional supercomputers aren't very good at all [1].

So, as we can conclude, quantum computers may help us solve problems, like modelling complex chemical processes, that our existing computers cannot do. Researchers are hoping that if they can use quantum mechanics, they could discover new ways to make the processes much more efficient.

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