What Exactly Is Abu Dhabi's Quantum Computer?

Abu Dhabi is set to join the exciting world of quantum computing by constructing its own model in the coming months and years. The project is being spearheaded by the Advanced Technology Research Council, who are working in collaboration with Qilimanjaro Quantum Tech from Barcelona to construct the prototype in the Emirati capital.

As a revolutionary new technology, quantum computing has the potential to change the way we live, work and think about the world. The extreme sophistication of the hardware means it is capable of solving problems that would previously have taken millennia in just a matter of minutes.

What is quantum computing?

Conventional computers work by using “bits” in a binary code, which means every function and feature is determined by a series of ones (indicating “on”) and zeroes (indicating “off”). However, this system is inherently flawed, since it operates on a finite capacity and means that even the world’s largest supercomputers would eventually exhaust their means in trying to solve extremely complex problems.

Quantum computers are different in that they dispense with bits altogether, instead favouring quantum bits, or “qubits”. These are far more advanced than regular bits and are capable of being in two states at the same time (both on and off), allowing the quantum computer to work at much faster speeds and analyse far greater reams of data almost instantaneously.

Indeed, Google announced that it had already reached “quantum supremacy” in 2019. This means that it had developed a quantum computer capable of calculating the answer to a fiendishly difficult mathematics problem in just four minutes. The same problem would have taken the world’s most powerful supercomputer at least 10,000 years to complete prior to the advent of quantum computing.

Limitless possibilities

While that event did mark a significant breakthrough in the field of quantum computing, the technology still has much room for improvement. At present, it requires an environment that is close to the coldest temperature that is physically possible on Earth in order for its components to remain stable. It is also very early days in exploring how exactly the technology could be applied.

However, scientists are very optimistic about the potential ramifications of mastering quantum computing going forwards. With the ability to assimilate and evaluate colossal amounts of data and consider many, many outcomes all at once, it's thought that quantum computing could greatly facilitate the discovery and development of drugs, where automation is already playing a major role in the sector.

That's just one among a virtually limitless panoply of possibilities, however. As well as massive scientific breakthroughs like finding a cure for cancer and determining how climate change will progress (and can be best mitigated), there is even speculation that quantum computing could answer several "bigger picture" questions, like where life on Earth came from and whether time can be manipulated.

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