# Quantum Computers

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In the recent HULU television series *Devs*, a tech company coder's life is upended when her co-worker boyfriend unexpectedly dies at the most promising point of his life and career. While the show is ostensible about how the girlfriend goes about finding out how and why her boyfriend died; the real interesting element running throughout the show, is the quantum computer the boyfriend was working on before he died. *Devs* is probably popular culture's first attempt to explain the concept of quantum computing to the public. However, the likely takeaway for most viewers will likely be that quantum computing is the tech industries attempt to become God. Indeed, the fact that the parameters of what a true quantum computer will really be able to accomplish, besides being incredibly fast, does create an essence of otherworldliness. This begs the question: outside of Hollywood storytelling, what is quantum computing.

To truly understand the concept of quantum computing, it is first necessary to understand the current state of computing, which is known as "classical" or "traditional" computing (Oliver, 2019). In classical computing, such as the one you are using to read this paper, data is broken down digitally into either a "0" or a "1". These are known as bits (Oliver 2019; Fulton, 2020). The reason for this is because the computer chips in can only read the information digitally. In classic computers, the chips inside can only check if the data it is reading is a "0" or "1" consecutively (Katwala, 2020). That is, it first determines if the data is a "0"; then if it is not, it checks if the data is a "1". In other words it cannot determine simultaneously that the data is not a "0" but a "1". In essence, it can make only one calculation at a time (Savage, 2019). Naturally, the either "0" or "1" methodology of current computer chips means that there is an automatic lag in the time that a computer comes to a decision. Technology, continues to reduce the latency of computer decision-making by making the chips work faster, however, the basic architecture of the chip will always produce some lag (Savage, 2019). In addition, while it is rather easy for a classical computer to read the data generated in text of this paper where it is easy to assign a "0" or "1" to the information, they are not as capable of reading data that is more difficult to render digitally. Indeed, much of the world cannot be rendered into digit (Katwala, 2020). As a result, there is uncertainty, and classic computers "aren't very good at dealing with uncertainty" (Katwala, 2020).

With a quantum computer, none of the barriers of operation that hamper classical computers exist. This is due to the fact that the computer chips used by quantum computers use "quantum bits" or "qubits" (Oliver, 2019; Savage, 2019; Katwala, 2020). A qubit is different than classical computer's ones and zeros because it, can in effect read data to simultaneous see if there is either a "0" or a "1" (Oliver, 2019; Savage, 2019; Katwala, 2020). That is, rather than being restricted to performing one calculation at a time, it can perform calculations simultaneously (Oliver, 2019; Savage, 2019; Katwala, 2020). It accomplishes this through a process known as "superposition" (Oliver, 2019; Savage, 2019; Katwala, 2020). Superposition refers to the ability of a quantum computer to think the data is both a "0" and "1" than as it is calculating, and follow the possibilities of being both to their logical end (Oliver, 2019; Savage, 2019; Katwala, 2020). As a result, quantum computers can come to answers that would confuse classical computers, since they do not have the "mental flexibility" see think two or three steps at a time.

The immediate takeaway of quantum computing is speed. Indeed, by being able to perform multiple calculations at a time, a quantum computer can reduce decision-making significantly. In fact, the more qubits a quantum computer is able to make use of, the more likely the latency can be reduced to zero (Oliver, 2019; Savage, 2019; Katwala, 2020). The secondary, takeaway - and this is where the “God-like” qualities expressed in *Devs* is illustrated- is that quantum computers can potential be used to solve questions that have confounded man since the beginning of time. In *Devs*, this was shown by a quantum computer being used to basically analyze life in order to accurately predict the short and long term future. In reality, quantum computing is expected to help resolve anything involving “large, uncertain complicated systems” (Oliver, 2019; Savage, 2019; Katwala, 2020). In particular, quantum computing is expected to power breakthroughs in navigation, medicine and pharmaceuticals, artificial intelligence, machine learning, and encryption/decryption (Fulton, 2020). Indeed, quantum computers promise to revolutionize the research and development sector, and of course computer science as both an academic field, and a source of business application, and private sector revenue.

While to promise of quantum computing is bright, it is not necessarily definite. The reason for this is that unlike classical computers, qubits are not particular stable, yet. That is, in order for them to perform at a high level they must be isolated from numerous forms of interference, such as heat (Fulton, 2020; Katwala, 2020). So far, the problem of providing continuous protection them from interference has not been resolved (Fulton, 2020; Katwala, 2020). Until it is, quantum computing will most likely remain an emerging technology, though one that will surely be the basis for more television shows and movies.

Work Cited

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