Surprising Innovations for The Future of Computing

Moore's Law states that the number of transistors on a microprocessor — and therefore their **computing** power — will double every two years. And, though it more of a **prediction** than a real law, the industry really does keeps finding new ways to pack more power onto tinier silicon chips. Unfortunately, they haven't found ways to cut costs on the same **exponential** curve. Besides, current manufacturing technology may not be able to **shrink** silicon transistors much more than it already has. And in any event, transistors have become so tiny that they may no longer **reliably** follow the usual laws of physics — which r**aises questions** about how much longer we'll dare to use them in medical devices or **nuclear plants**.

So does that mean the era of exponential tech-driven change is about to come to a screeching halt? Not at all. Here are a few of the **emerging** technologies that promise to keep computing performance rocketing ahead:

In-memory computing. Throughout computing history, the slowest part of **processing** has been getting the **data** from the hard disks where it's **stored** to random access memory (RAM), where it can be used. A lot of processor power is **wasted** simply waiting for data to arrive. By contrast, in-memory computing puts **massive** amounts of data into RAM where it can be processed immediately. Combined with new database, analytics, and systems designs, it can dramatically improve both **performance** and **overall** costs.

Graphene-based microchips. Graphene — one molecule thick and more **conductive** than any other known material can be rolled up into tiny tubes or combined with other materials to move electrons faster, in less space, than even the smallest silicon transistor. This will **extend** Moore's Law for microprocessors a few years longer.

Quantum computing. Even the most sophisticated **conventional** computer can only **assign** a one or a zero to each bit. Quantum computing, by contrast, uses quantum bits, or Qubits, which can be a zero, a one, both at once, or some point in between, all at the same time. **Theoretically**, a quantum computer will be able to solve highly complex problems, like analyzing genetic data or testing aircraft systems, millions of times faster than currently possible. Google researchers **announced** in 2015 that they had developed a new way for qubits to **detect** and protect against **errors**, but that's as close as we've come so far.

Molecular electronics. Researchers at Sweden's Lund University have used nanotechnology to build a "biocomputer" that can perform parallel calculations by moving **multiple** protein filaments **simultaneously** along nanoscopic **artificial** pathways. This biocomputer is faster than conventional electrical computers that operate sequentially, approximately 99 percent more energy-efficient, and cheaper than both conventional and quantum computers to produce and use. It's also more likely to be **commercialized** soon than quantum computing is.

DNA data storage. Convert data to base 4 and you can encode it on synthetic DNA. Why would we want to do that? Simple: a little bit of DNA stores a whole lot of information. In fact, a group of Swiss researchers speculate that about a teaspoon of DNA could hold all the data humans have **generated** to date, from the first cave drawings to yesterday's Facebook status updates. It currently takes a lot of time and money, but gene editing may be the future of big data: Futurism recently **reported** that Microsoft is i**nvestigating** the use of synthetic DNA for secure long-term data **storage** and has been able to encode and **recover** 100 percent of its **initial** test data.

Passive Wi-Fi. A team of computer scientists and electrical engineers at the University of Washington has developed a way to generate Wi-Fi transmissions that use 10,000 times less power than the current battery-draining standard. While this isn't technically an increase in computing power, it is an exponential increase in connectivity, which will **enable** other types of **advances**. Dubbed one of the 10 **breakthrough** technologies of 2016 by MIT Technology Review, Passive Wi-Fi will not only **save** battery life, but enable a **minimal-**power Internet of Things, allow previously power-hungry devices to connect via Wi-Fi for the first time, and potentially create **entirely** new modes of communication.

Adapted from the D!gitalist Magazine