Five ways quantum computing will change the way we think about computing

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While technologies that currently run on classical computers, such as Watson, can help find patterns and insights buried in vast amounts of existing data, quantum computers will deliver solutions to important problems where patterns cannot be seen because the data doesn't exist and the possibilities that you need to explore to get to the answer are too enormous to ever be processed by classical computers.

In March 2017, IBM announced the industry's first initiative to build commercially available universal [quantum computing](#) systems. "IBM Q"quantum systems and services will be delivered via the IBM Cloud platform.

IBM Q systems will be designed to tackle problems that are currently seen as too complex and exponential in nature for classical computing systems to handle. One of the first and most promising applications for quantum computing will be in the area of chemistry. Even for simple molecules like caffeine, the number of quantum states in the molecule can be astoundingly large –so large that all the conventional computing memory and processing power scientists could ever build could not handle the problem.

The IBM Q systems promise to solve problems that today's computers cannot tackle, for example:

1. Drug and Materials Discovery: Untangling the complexity of molecular and chemical interactions leading to the discovery of

new medicines and materials

2. Supply Chain & Logistics: Finding the optimal path across global systems of systems for ultra-efficient logistics and supply chains, such as optimizing fleet operations for deliveries during the holiday season

3. Financial Services: Finding new ways to model financial data and isolating key global risk factors to make better investments

4. Artificial Intelligence: Making facets of artificial intelligence such as machine learning much more powerful when data sets can be too big such as searching images or video

5. Cloud Security: Making cloud computing more secure by using the laws of quantum physics to enhance private data safety

As part of the IBM Q System, IBM has released a new API (Application Program Interface) for the IBM Quantum Experience that enables developers and programmers to begin building interfaces between its existing five quantum bit (qubit) cloud-based quantum computer and classical computers, without needing a deep background in quantum physics. IBM has also released an upgraded simulator on the IBM Quantum Experience that can model circuits with up to 20 qubits. In the first half of 2017, IBM plans to release a full SDK (Software Development Kit) on the IBM Quantum Experience for users to build simple quantum applications and software programs.

The IBM Quantum Experience enables anyone to connect to IBM's quantum processor via the IBM Cloud, to run algorithms and experiments, work with the individual quantum bits, and explore tutorials and simulations around what might be possible with quantum computing.

More information: For more information on IBM's universal quantum computing efforts, visit www.ibm.com/ibmq
Quantum API available on GitHub: github.com/IBM/qiskit-api-py

Simple demonstration scripts: github.com/IBM/qiskit-sdk-py

Provided by IBM

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