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Overview of Quantum Computing

Quantum computing is the next generation of computing power that will revolutionize the problems humans can solve. Using the power of quantum mechanics, we can solve complex problems that current supercomputers cannot and will not ever solve. Problems using many combinations exceed the working memory capabilities of supercomputers because they must run through each combination one at a time. Quantum computers can create vast multidimensional space to represent the problems, find the solution, and translate it back to us. Instead of traditional bits, they use qubits, or quantum bits, which can store information in quantum form. This process requires superfluids that chill superconductors to almost absolute zero, through which electrons are put in to. These electrons pair up and quantum tunnel through a Josephson function. These form superconducting qubits which we can fire photons at to solve complex problems which are represented with programmable gates.

Data and Analytics will be greatly altered in the future with the use of quantum computers. One of the main ways that quantum computing will advance the field is through increased speed. This will allow data analysts to administer much larger data sets and compute through them in a reasonable amount of time. Some analyses may take days or weeks or may not be possible at all with a current supercomputer. Quantum computers could solve some of these problems in seconds to minutes. One example of this would be querying data from a data set, something at the core of our data analytics course.

An example of this increased ability is Grover’s Search which is used to find an item from a list. Using a traditional computer, you will have to search through, on average, the number of items in the list divided by two while a quantum computer will only need to search through the square root of the number of items. If you are searching for one item in a list of a trillion at one microsecond per item, this is the difference between one week and one second. A lot of the real-world applications of quantum computing are unknown at the present time, because they are still being built. No one is exactly sure the impacts quantum computing will have, but it will certainly revolutionize data analytics.

References:

Fisher, Chris. “IBM: What Is Quantum Computing?” *IBM Quantum*, 2 Apr. 2009, <https://www.ibm.com/quantum-computing/what-is-quantum-computing/>.