Variational Quantum Algorithms

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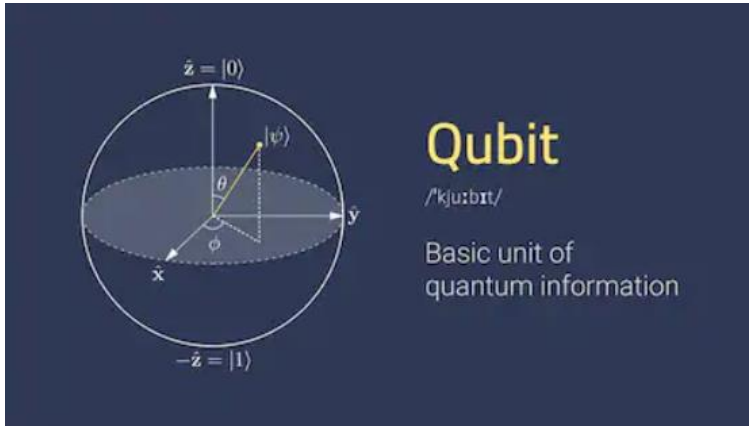
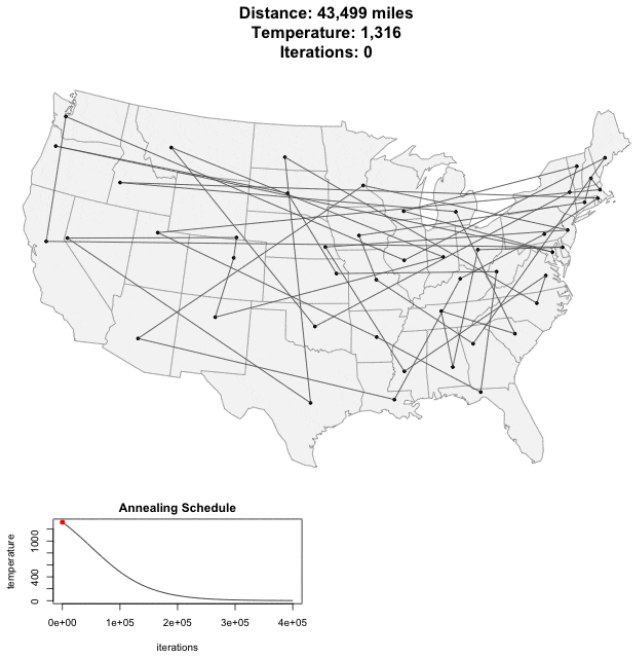
What is a Quantum Computer?

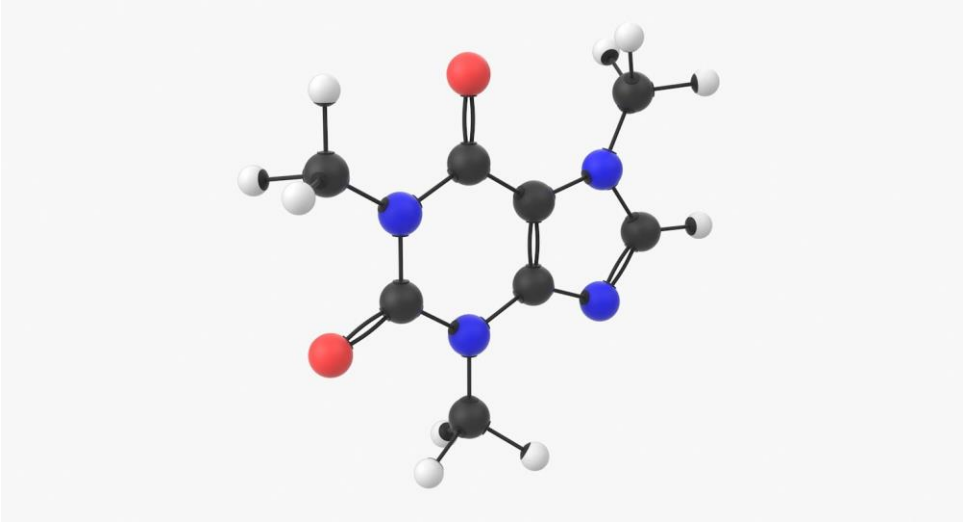
- Classical computers (non-quantum) use bits
- Quantum computers use “quantum bits” (qubits)



Why use Quantum Algorithms?

- Moore's Law is ending. We are reaching fundamental limit in transistor size.
- Some important problems are too hard for classical computers.
- We would like to solve these problems anyway.



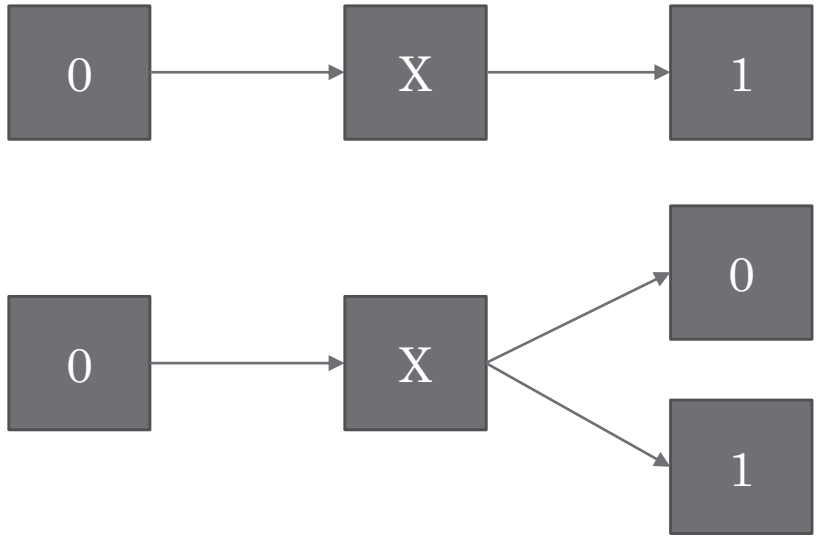


Theoretical Quantum Algorithms

- Cannot run on near-term quantum devices but have great theoretical properties.
  - E.g. Shor's algorithm and Grover's Algorithm

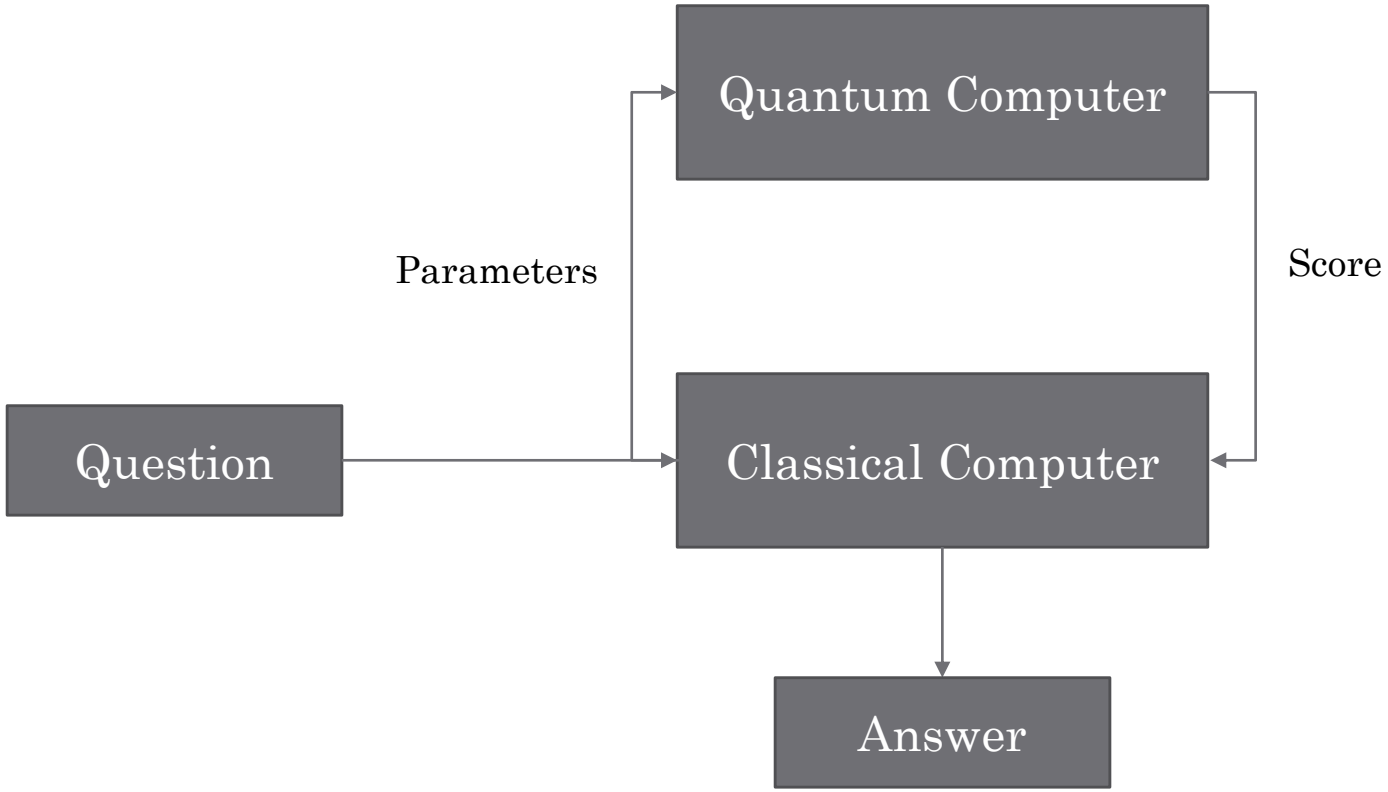
NISQ era of Quantum Hardware

- Preskill 2018:
  - Limited qubit count.
  - Limited gate fidelity.
  - Noise, noise, noise.
- You want your computer to do what you tell it to do.
- How to verify a solution is correct?



Variational Quantum Eigensolver

- Hybrid quantum/classical algorithm.



Any Questions?