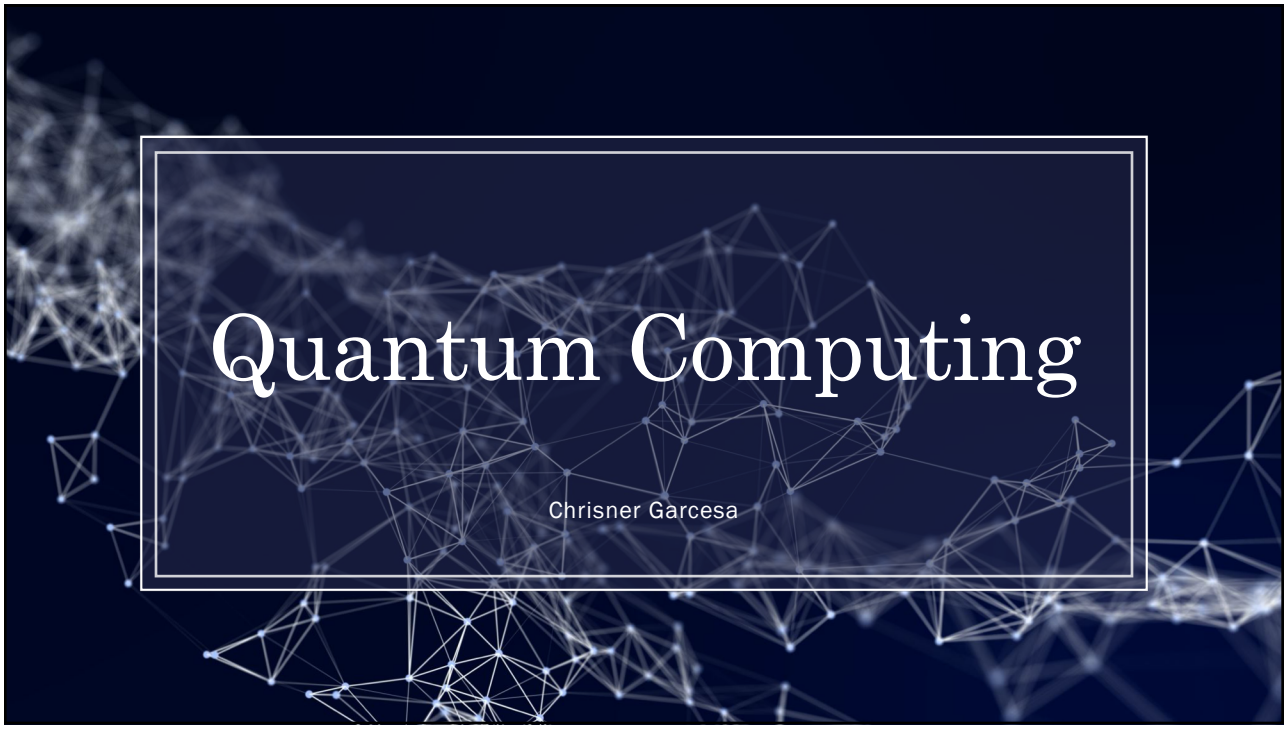


Short History of Quantum Computing

Idea for using quantum mechanics for computing started as early as the 60s

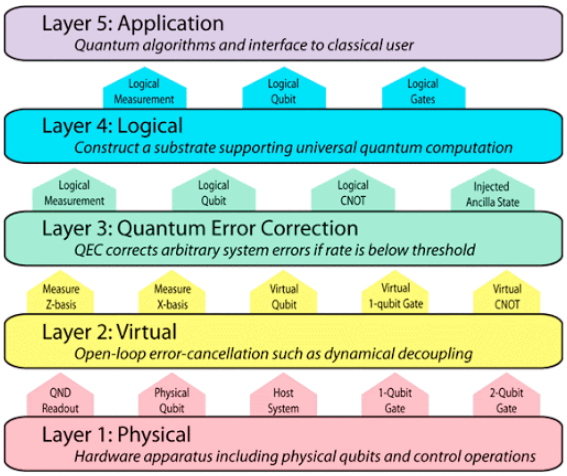
Development did not start until the 80s

Turing Machine Model
Shor's Algorithm

First Quantum Computer built in the late 1990s

Basically a 2-qubit quantum computer

More progress is being made



Quantum Computer Architecture

- Quantum computers use classical and quantum parts
- Layered Control Stack
  - (1) Physical
  - (2) Virtual
  - (3) Quantum Error Connection (QEC)
  - (4) Logical
  - (5) Application

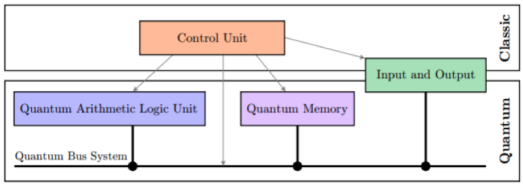


Figure 6: The Quantum von Neumann architecture.

Von Neumann Architecture

- Has similar architecture to that of a classical computer
  - Control Unit
  - Quantum Arithmetic Logic Unit
  - Quantum Memory
  - I/O
  - Quantum Bus System
    - This part is new to the system
- Information can't be copied, so it can be moved in a couple of ways
  - Physically moving Qubits
  - Quantum Teleportation
  - Coupling information to Photons

Some Limitations

- Moving qubits
  - Some methods require more hardware
- Can be disrupted by external factors
  - External noise
  - Faults or loss of quantum coherence
- Results are not entirely useful and may not be correct
- Some approaches to these problems
  - Guessing what an error-free computation would be like
  - Hybrid Quantum-classical algorithms

Sources

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