CS293S Quantum Computing System

Lecture 6-8: Quantum Algorithms and Quantum Speedup

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Quantum Promise



 Certain problems which are difficult classically, are easy on quantum computers, e.g., integer factoring

- Can't efficiently simulate a quantum computer on a classical computer
 - Expected to be hard due to complexity arguments

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Algorithmic Complexity



✤P: Efficiently solved by classical computer

BQP: Efficiently solved by quantum computer

♦
$$P = NP$$
?

Outline

- Reversible Logic and Oracles
 - Quantum circuits for classical computing.
- Quantum Speedup
 - Parallelism and Interference
- Quantum Algorithms



Reversible Logic and Oracles

Note4.pdf

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Quantum Algorithm

• Note5.pdf

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Quantum Fourier Transform



4 qubit case

More general discussion on the reference book P217

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