

Quantum errors and error correction techniques

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September 2024

The need for quantum computation

It grants speedup for "difficult" computational problems

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- Search problems with Grover's algorithm

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But there is a catch...

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But there is a catch... Errors

- simple quantum systems

Qubits

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- modeled by a 2-dimensional Hilbert space

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$$\alpha |0\rangle + \beta |1\rangle$$

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Bloch sphere

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Bloch sphere

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Quantum errors

Classical error correction

Challenges in the quantum case

Quantum codes

