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Coherence: a Resource for Quantum Algorithms in Quantum Computing

Quantum computing uses principles from quantum mechanics that might solve certain problems that classical computers find very hard or slow to handle. It can be especially helpful in areas like optimization, cryptography and simulating quantum systems. A key aspect of this is quantum coherence, we discuss the role of resource theory in understanding the potential power of quantum computing. This shows the need for resource theory framework to understand and measure coherence. This work explores how coherence can be detected and measured in different quantum algorithms. We also study how to manage and analyze coherence in quantum systems using free states, free operations and quantum noise channel. The aim is to strengthen quantum computing by preserving and utilizing coherence more efficiently.

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