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Quantum Optimal Control Using Tensor Networks

Determining optimal time-dependent fields to steer quantum systems is a critical yet computationally demanding
task, often complicated by vast and complex search landscapes. This work explores the application
of tensor network methodologies to navigate these high-dimensional parameter spaces in quantum optimal control effectively. We investigate how structured, low-rank tensor representations can be utilized for the efficient parameterization and discovery of effective control trajectories. Our approach involves an iterative refinement process where the tensor network model is adaptively updated based on simulated quantum system
performance. This allows for a guided exploration of the control landscape, aiming to identify highly effective control strategies. The potential benefits include enhanced search efficiency and the ability to tackle complex control problems relevant to emerging quantum technologies.

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