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High-fidelity single-shot three-qubit gates via machine learning.[1]
EHSAN ZAHEDINEJAD, JOYDIP GHOSH, BARRY C. SANDERS, University of Calgary — Three-qubit quantum gates play a crucial role in quantum error correction and quantum information processing. Here I discuss how to generate policies for quantum control to design three-qubit gates namely, Toffoli, Controlled-Not-Not and Fredkin gates for an architecture of nearest-neighbor-coupled superconducting artificial atoms. The resulted fidelity for each gate is above the 99.9% which is the threshold fidelity for fault-tolerant quantum computing. We test our policy in the presence of decoherence-induced noise as well as show its robustness under random external noise. The three-qubit gates are designed via our machine learning algorithm called Subspace-Selective Self-Adaptive Differential Evolution (SuSSADE).

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