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Quantum optimal control with automatic differentiation using graphics processors NELSON LEUNG, MOHAMED ABDELHAFEZ, SRIVATSAN CHAKRAM, RAVI NAIK, Univ of Chicago, PETER GROSZKOWSKI, JENS KOCH, Northwestern University, DAVID SCHUSTER, Univ of Chicago — We implement quantum optimal control based on automatic differentiation and harness the acceleration afforded by graphics processing units (GPUs). Automatic differentiation allows us to specify advanced optimization criteria and incorporate them into the optimization process with ease. We will describe efficient techniques to optimally control weakly anharmonic systems that are commonly encountered in circuit QED, including coupled superconducting transmon qubits and multi-cavity circuit QED systems. These systems allow for a rich variety of control schemes that quantum optimal control is well suited to explore.

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