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Machine Learning for Quantum Metrology and Quantum Control[1] BARRY SANDERS[2], EHSAN ZAHEDINEJAD, PANTITA PALITTAPONGARNPIM, University of Calgary — Generating quantum metrological procedures and quantum gate designs, subject to constraints such as temporal or particle-number bounds or limits on the number of control parameters, are typically hard computationally. Although greedy machine learning algorithms are ubiquitous for tackling these problems, the severe constraints listed above limit the efficacy of such approaches. Our aim is to devise heuristic machine learning techniques to generate tractable procedures for adaptive quantum metrology and quantum gate design. In particular we have modified differential evolution to generate adaptive interferometric-phase quantum metrology procedures for up to 100 photons including loss and noise, and we have generated policies for designing single-shot high-fidelity three-qubit gates in superconducting circuits by avoided level crossings. Although quantum metrology and quantum control are regarded as disparate, we have developed a unified framework for these two subjects, and this unification enables us to transfer insights and breakthroughs from one of the topics to the other.

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