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**Gradient Optimization for Analytic conTrols - GOAT** ELIE ASSÉMAT, Saarland University, SHAI MACHNES, DAVID TANNOR, Weizmann Institute of Science, FRANK WILHELM-MAUCH, Saarland University — Quantum optimal control becomes a necessary step in a number of studies in the quantum realm. Recent experimental advances showed that superconducting qubits can be controlled with an impressive accuracy. However, most of the standard optimal control algorithms are not designed to manage such high accuracy. To tackle this issue, a novel quantum optimal control algorithm have been introduced: the Gradient Optimization for Analytic conTrols (GOAT). It avoids the piecewise constant approximation of the control pulse used by standard algorithms. This allows an efficient implementation of very high accuracy optimization. It also includes a novel method to compute the gradient that provides many advantages, e.g. the absence of backpropagation or the natural route to optimize the robustness of the control pulses. This talk will present the GOAT algorithm and a few applications to transmons systems.

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