Second part, with same title and sorting category (different abstract), presented by Elie Assmat, is submitted separately.
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Abstract Submitted
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Tunable, Flexible and Efficient Optimization of Control Pulses for Superconducting Qubits, part I - Theory SHAI MACHNES, ELIE ASSMAT, Saarland University, DAVID TANNOR, Weizmann Institute, FRANK WILHELM, Saarland University — Quantum computation places very stringent demands on gate fidelities, and experimental implementations require both the controls and the resultant dynamics to conform to hardware-specific ansatzes and constraints. Superconducting qubits present the additional requirement that pulses have simple parametrizations, so they can be further calibrated in the experiment, to compensate for uncertainties in system characterization. We present a novel, conceptually simple and easy-to-implement gradient-based optimal control algorithm, GOAT [1], which satisfies all the above requirements. In part II we shall demonstrate the algorithm's capabilities, by using GOAT to optimize fast high-accuracy pulses for two leading superconducting qubits architectures - Xmons and IBM's flux-tunable couplers. [1] S. Machnes et al., arXiv 1507.04261 (2015)

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