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Automatic differentiation for Monte Carlo processes

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Automatic Differentiation (AD) techniques allows to determine the
Taylor expansion of any deterministic function. The generalization of
these techniques to stochastic problems is not trivial. In this work we explore two approaches to extend the ideas of AD to Monte Carlo processes, one based on reweighting (importance sampling) and another one based on the ideas from the lattice field theory community (numerical stochastic perturbation theory using the Hamiltonian formalism). We show
that, when convergence can be guaranteed, the approach based on NSPT is
able to converge to the Taylor expansion with a much smaller variance.

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