Day 2

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Title: Variational counterdiabatic driving of the p-spin model

Abstract:
Real-life quantum annealers perform finite-temperature adiabatic quantum computation in dissipative environments. In order to decrease thermal noise, it is paramount to reduce the computation time without violating the adiabatic theorem. This motivates the interest in shortcuts-to-adiabaticity and counterdiabatic (CD) driving. Approximate CD operators, satisfying locality constraints, can be constructed by following a variational approach. This formulation allows avoiding the shortcomings of the exact CD potential, which is highly nonlocal and often impossible to implement experimentally [1]. In this contribution, we apply the variational CD formulation to the ferromagnetic p-spin model. We show a very successful ansatz, which is able to fast-drive the system across its quantum critical point independently of the number of qubits, and compare it with the nested commutators ansatz [2]. We also discuss a possible generalization of the variational approach to open-system Lindbladian dynamics.

[1] D. Sels, A. Polkovnikov, PNAS 114 (20) (2017)
[2] G. Passarelli et al., PRResearch 2, 013283 (2020)