Day 1 (Poster B)

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Title: Stoquastic diabatic quantum annealing: a coherence testing tool.

Abstract:
We present a method for characterising the coherence metrics of quantum annealing hardware using stoquastic annealing Hamiltonians and solving optimization problems using stoquastic diabatic quantum annealing (SDQA). We show that given the ability to control the individual local transverse fields of qubits it is possible to create double energy minima and energy crossings in the energy spectrum during an anneal. This property of the spectrum can be exploited to perform diabatic quantum annealing on problems which are difficult to solve adiabatically. To this end, we first discuss the underlying physics of the method, which involves the controlled suppression of quantum tunnelling of a single qubit. In the context of optimization, we show that this method is particularly suited to problems in which a low-order phase transition occurs. More importantly, we show that by choosing a suitable schedule for the transverse fields, experimentally feasible multiqubit coherent oscillations can arise. This demonstrates the important advantage of the method, which enables us to characterise the role of the environment in an arbitrarily large quantum annealing processor. Furthermore, the SDQA method opens up new possibilities for the characterisation of black-box 'hard' annealing problems.

This work was done in collaboration with Daniel O'Connor, Natasha Feinstein, Paul Warburton.