Abstract Submitted
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Quantum-assisted learning of graphical models with arbitrary pairwise connectivity[1] JOHN REALPE-GMEZ, NASA/Ames Res Ctr, MARCELLO BENEDETTI, University College London, RUPAK BISWAS, ALEJANDRO PERDOMO-ORTIZ, NASA/Ames Res Ctr — Mainstream machine learning techniques rely heavily on sampling from generally intractable probability distributions. There is increasing interest in the potential advantages of using quantum computing technologies as sampling engines to speedup these tasks. However, some pressing challenges in state-of-the-art quantum annealers have to be overcome before we can assess their actual performance. The sparse connectivity, resulting from the local interaction between quantum bits in physical hardware implementations, is considered the most severe limitation to the quality of constructing powerful machine learning models. Here we show how to surpass this 'curse of limited connectivity' bottleneck and illustrate our findings by training probabilistic generative models with arbitrary pairwise connectivity on a real dataset of handwritten digits and two synthetic datasets in experiments with up to 940 quantum bits. Our model can be trained in quantum hardware without full knowledge of the effective parameters specifying the corresponding Boltzmann-like distribution. Therefore, the need to infer the effective temperature at each iteration is avoided, speeding up learning, and the effect of noise in the control parameters is mitigated, improving accuracy.

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