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Artificial neural networks as quantum associative memory[1]
KATHLEEN HAMILTON, JONATHAN SCHROCK, NEENA IMAM, TRAVIS HUMBLE, Oak Ridge National Laboratory — We present results related to the recall accuracy and capacity of Hopfield networks implemented on commercially available quantum annealers. The use of Hopfield networks and artificial neural networks as content-addressable memories offer robust storage and retrieval of classical information, however, implementation of these models using currently available quantum annealers faces several challenges: the limits of precision when setting synaptic weights, the effects of spurious spin-glass states and minor embedding of densely connected graphs into fixed-connectivity hardware. We consider neural networks which are less than fully-connected, and also consider neural networks which contain multiple sparsely connected clusters. We discuss the effect of weak edge dilution on the accuracy of memory recall, and discuss how the multiple clique structure affects the storage capacity. Our work focuses on storage of patterns which can be embedded into physical hardware containing $n < 1000$ qubits.

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