Condensed Matter > Disordered Systems and Neural Networks

Quantum Annealing for Dirichlet Process Mixture Models with Applications to Network Clustering

Issei Sato, Shu Tanaka, Kenichi Kurihara, Seiji Miyashita, Hiroshi Nakagawa

(Submitted on 19 May 2013)

We developed a new quantum annealing (QA) algorithm for Dirichlet process mixture (DPM) models based on the Chinese restaurant process (CRP). QA is a parallelized extension of simulated annealing (SA), i.e., it is a parallel stochastic optimization technique. Existing approaches [Kurihara et al. UAI2009, Sato et al. UAI2009] and cannot be applied to the CRP because their QA framework is formulated using a fixed number of mixture components. The proposed QA algorithm can handle an unfixed number of classes in mixture models. We applied QA to a DPM model for clustering vertices in a network where a CRP seating arrangement indicates a network partition. A multi core processor was used for running QA in experiments, the results of which show that QA is better than SA, Markov chain Monte Carlo inference, and beam search at finding a maximum a posteriori estimation of a seating arrangement in the CRP. Since our QA algorithm is as easy as to implement the SA algorithm, it is suitable for a wide range of applications.

Comments: 12 pages, 6 figures, accepted in Neurocomputing

Subjects: **Disordered Systems and Neural Networks (cond-mat.dis-nn)**; Statistical Mechanics (cond-mat.stat-mech); Quantum Physics (quant-ph); Machine Learning (stat.ML)

Cite as: **arXiv:1305.4325 [cond-mat.dis-nn]**

(or **arXiv:1305.4325v1 [cond-mat.dis-nn]** for this

version)