

some thoughts

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1 Some thoughts for statistical mechanics method to analyse Unsupervised model

Firstly, just like binary model, to get the solution structure of entropy space, we can use method similar as local entropy , for RBM we know for uniform prior distribution, the bayes posterior of the feature is :

$$P(\xi|\{\sigma^a\}) = \frac{1}{Z} \prod_a^M P(\{\sigma^a\}|\xi)$$

we can choose a reference feature ξ^* ,now the distribution is :

$$P(\xi, x|\{\sigma^a\}) = \frac{1}{Z} \prod_a^M P(\{\sigma^a\}|\xi) e^{x\xi\xi^*}$$

The free energy will be

$$f = -\frac{1}{\beta N} \int d\epsilon dq e^{N(\beta\epsilon + xq + s(\epsilon, q))}$$

we can also use Franz-Parisi potential as :

$$f = \langle \frac{1}{Z(\xi')} \sum_{\xi'} e^{-\beta' \epsilon(\xi')} \ln \sum_{\xi} e^{-\beta \epsilon(\xi) + x\xi\xi'} \rangle$$

2 model selection

if we add sparse prior or group lasso . we can get the performance of different Regularization. (ℓ_1, ℓ_2)

3 out of Nishimori line

we can use EM algorithm to estimate the optimal temperature. when generative model and inference model is different , we can analyze the free entropy $f(q)$, where q is the overlap of ξ and ξ^{true} , free energy may dominate by some local maximum , ASP(arxiv:1807.01296) may shed light on this problem.