An exposition on the propriety of restricted Boltzmann machines

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Deep learning

Degeneracy in random graph models

Tiny example

Restricted Boltzmann machine (RBM)

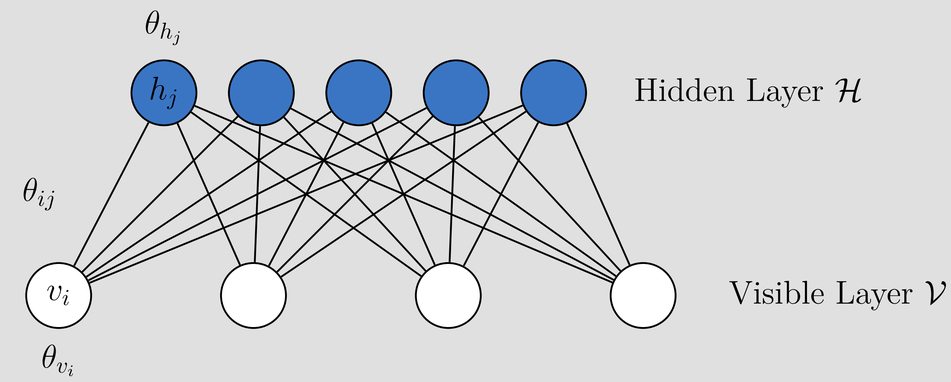

Figure 1: An example restricted Boltzmann machine (RBM), which consists of two layers, a hidden ($\mathcal{H}$) and a visible layer ($\mathcal{V}$), with no connections within a layer. Hidden nodes indicated by gray circles and the visible nodes indicated by white circles.

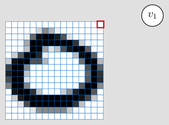

Figure 2: Visibles diagram.

Joint distribution

Let $\boldsymbol{x} = \{h_1, \ldots, h_H, v_1, \ldots, v_V\}$ represent the states of the visible and hidden nodes in an RBM. Then the probability corresponding to the state of each node taking the value of 1:

$$f_{\boldsymbol{\theta}}(\boldsymbol{x}) = \frac{\exp\left(\sum_{i=1}^{V}\sum_{j=1}^{H}\theta_{ij}v_ih_j + \sum_{i=1}^{V}\theta_{v_i}v_i + \sum_{j=1}^{H}\theta_{h_j}h_j\right)}{\sum_{\boldsymbol{x}\in\mathcal{X}}\exp\left(\sum_{i=1}^{V}\sum_{j=1}^{H}\theta_{ij}v_ih_j + \sum_{i=1}^{V}\theta_{v_i}v_i + \sum_{j=1}^{H}\theta_{h_j}h_j\right)} \tag{1}$$

References

Managable examples

Fitting

Discussion

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