

## Assignment 1 Q3)

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### DEEP BELIEF NETWORK :

## Deep Belief Networks

[Hinton06] showed that RBMs can be stacked and trained in a greedy manner to form so-called Deep Belief Networks (DBN). DBNs are graphical models which learn to extract a deep hierarchical representation of the training data. They model the joint distribution between observed vector  $x$  and the  $\ell$  hidden layers  $h^k$  as follows:

$$(1) \quad P(x, h^1, \dots, h^\ell) = \left( \prod_{k=0}^{\ell-2} P(h^k | h^{k+1}) \right) P(h^{\ell-1}, h^\ell)$$

where  $x = h^0$ ,  $P(h^{k-1} | h^k)$  is a conditional distribution for the visible units conditioned on the hidden units of the RBM at level  $k$ , and  $P(h^{\ell-1}, h^\ell)$  is the visible-hidden joint distribution in the top-level RBM.

Architecture	epochs	BATCH SIZE	ERROR
[100]	1	100	65.6136
[100]	10	100	41.0078
[100 500]	1	100	65.6136
[100 500]	10	100	41.7401
[100]	40	100	39.6237

Error decrease with no. of epochs.

