3) Markov Random Fields

b) $\beta = h = 0$

$$E(x,y) = 0 \sum_i x_i - 0 \sum_{\{i,j\}} x_i x_j - \eta \sum_i x_i y_i$$

$$\therefore E(x,y) = -\eta \sum_i x_i y_i$$

Most probable configuration is given by $x_i = y_i$ for all i

Suppose index j satisfies $x_j \neq y_j$ which will result in

$$x_j y_j = -1.$$

By changing the sign of x_i $E(x,y)$ could be minimized.

$\therefore$ For $y_i \in (-1,1)$ and $x_i \in (-1,1)$.

where $i = 1 \ldots D$

To get the most probable configuration which maintains minimum energy in the energy function

set $\boxed{x_i = y_i \text{ for all } i}$

X——X