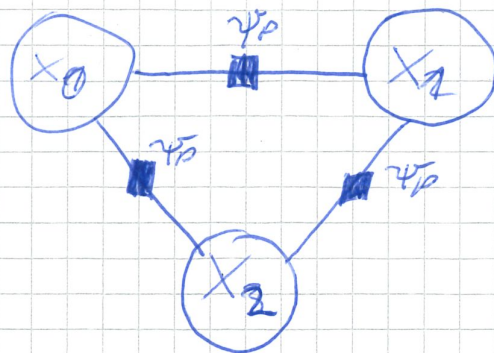


b)

a)



$$b) E_1(x_0=0, x_1=0, x_2=0) = 0,1 + 0,8 + 0,9 + 0 + 0 + 0 = 1,8$$

$$E_2(x_0=1, x_1=0, x_2=0) = 0,9 + 0,8 + 0,9 + 1 + 1 + 0 = 4,6$$

$$E_3(x_0=1, x_1=1, x_2=0) = 0,9 + 0,1 + 0,9 + 0 + 1 + 1 = 3,9$$

$$E_4(x_0=1, x_1=1, x_2=1) = 0,9 + 0,1 + 0,1 + 0 + 0 + 0 = 1,1$$

$$E_5(x_0=0, x_1=1, x_2=1) = 0,1 + 0,1 + 0,1 + 1 + 1 + 0 = 2,3$$

$$E_6(x_0=0, x_1=0, x_2=1) = 0,1 + 0,8 + 0,1 + 0 + 1 + 1 = 3$$

$$E_7(x_0=1, x_1=0, x_2=1) = 0,9 + 0,8 + 0,1 + 1 + 0 + 1 = 3,8$$

$$E_8(x_0=0, x_1=1, x_2=0) = 0,1 + 0,1 + 0,9 + 1 + 0 + 1 = 3,1$$

$$c) x_0=1, x_1=1, x_2=1$$

$$d) p = e^{-1,8} + e^{-4,6} + e^{-3,9} + e^{-1,1} + e^{-2,3} + e^{-3} + e^{-3,8} + e^{-3,1} = 0,7459$$

$$p_1(x) = \frac{1}{p} e^{(-E_1(x))} = 1,096$$

$$p_5(x) = 0,665$$

$$p_2(x) = \frac{1}{p} e^{(-E_2(x))} = 0,0666$$

$$p_6(x) = 0,33$$

$$p_3(x) = \frac{1}{p} e^{(-E_3(x))} = 0,134$$

$$p_7(x) = 0,148$$

$$p_4(x) = \frac{1}{p} e^{(-E_4(x))} = 2,207$$

$$p_8(x) = 0,299$$

Exercise 2

17

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$$\psi(z_i, z_j) = \begin{cases} 0 & \text{if } z_i = z_j \\ 1 & \text{if } z_i \neq z_j \end{cases} \quad \text{oder} \quad \begin{cases} 1 & \text{if } z_i = z_j \\ 0 & \text{if } z_i \neq z_j \end{cases}$$

$$E(z_0) = \psi(z_0, z_1) + \psi(z_0, z_3)$$

$$z_0 = z_1 = z_3 \Rightarrow E(z_0) = 0 \quad \text{a) Minima}$$
$$= 1 \quad \text{b)}$$

$$z_0 = z_1 \neq z_3 \Rightarrow E(z_0) = 1 \quad \text{a) b)}$$

$$z_1 = z_3 \neq z_0 \Rightarrow E(z_0) = 2 \quad \text{a)}$$
$$= 0 \quad \text{b) Minima}$$

$$E(z_1) = \psi(z_1, z_0) + \psi(z_1, z_2) + \psi(z_1, z_4)$$

$$z_0 = z_1 = z_2 = z_4 \Rightarrow E(z_1) = 0 \quad \text{a) Minima}$$

$$z_0 = z_2 = z_4 \neq z_1 \Rightarrow E(z_1) = 0 \quad \text{b) Minima}$$

Instructions:

Global minima appear, for configuration a) when all neighbors have the same value as the inspected node. For configuration b) all neighbors need to have a different value than the inspected. This means, that all nodes have the same value except of the inspected one.

3)

a) When all neighbours of the node are equal to the node itself then $E(Z)=0$
For Ex.: $E(z_1=0, z_2=0)=0 \Rightarrow z_1=z_2$

b) It must be fulfilled, that the neighbours of the respective node are not connected with each other and that every single neighbour is not equal to the node.