Bishop 8.3

$$p(a,b) = \sum_{c \in \{0,1\}} p(a,b,c) \quad \text{and} \quad p(a) = \sum_{b \in \{0,1\}} \sum_{c \in \{0,1\}} p(a,b,c)$$

$$p(b) = \sum_{a \in \{0,1\}} \sum_{c \in \{0,1\}} p(a,b,c)$$

$$p(a,b|c) = \frac{p(a,b,c)}{\sum_{a \in \{0,1\}} \sum_{b \in \{0,1\}} p(a,b,c)}$$

$$p(a|c) = \frac{\sum_{b \in \{0,1\}} p(a,b,c)}{\sum_{a \in \{0,1\}} \sum_{b \in \{0,1\}} p(a,b,c)} \quad \text{and} \quad p(b|c) = \frac{\sum_{a \in \{0,1\}} p(a,b,c)}{\sum_{a \in \{0,1\}} \sum_{b \in \{0,1\}} p(a,b,c)}$$

Bishop 8.4

$$p(c|a) = \frac{\sum_{b \in \{0,1\}} p(a,b,c)}{\sum_{b \in \{0,1\}} \sum_{c \in \{0,1\}} p(a,b,c)}$$

a	$p(a)$
0	600.00
1	400.00

c	a	$p(c\|a)$
0	0	0.40
0	1	0.60
1	0	0.60
1	1	0.40

b	c	$p(b\|c)$
0	0	0.80
0	1	0.40
1	0	0.20
1	1	0.60

$a \to c \to b$

Bishop 8.11

$$p(F=0|D=0) = \frac{p(D=0|F=0)\,p(F=0)}{p(D=0)}$$

$$p(D=0|F=0) = \sum_{B,G} p(D=0|G)\,p(G|B,F=0)\,p(B)$$

$$= 0.748 \;(74.8\%)$$

$$p(D=0) = \sum_{B,G,F} p(D=0|G)\,p(G|B,F)\,p(B)\,p(F)$$

$$= 0.352 \;(35.2\%)$$

$$\rightarrow p(F=0|D=0) = 0.213 \;(21.3\%)$$

$$\rightarrow p(F=0|D=0,B=0) = 0.11 \;(11\%)$$

Bishop 8.14

This is obtained when $\forall i \in \{1,\ldots,D\} : x_i = y_i$; since $\eta > 0$, $h = \beta = 0$, and $x_i, y_i \in \{-1,+1\}$.