

Fall 2019

\* Question 5] Bayesian Network



$$P(A=1) = 0.3$$

$$P(C=1|A=1) = 0.6, P(C=1|A=0) = 0.2$$

$$P(C=1|B=1) = 0.1, P(C=1|B=0) = 0.9$$

Data points

A	B	C	Weight
0	1	0	$w_1$
0	1	1	$w_2$
0	1	1	1
0	0	1	$w_3$
1	0	1	$w_4$
1	1	0	$w_5$
1	1	1	$w_6$
0	0	0	1
1	1	1	1

Joint probability,

$$\Rightarrow P(C|B) P(B|A) P(A)$$

$$w_1 = 0.7 \times 0.2 \times (1-0.1)$$

$$w_2 = (1-0.3) \times 0.2 \times 0.1$$

$$w_3 = 0.7 \times 0.2 \times 0.1$$

$$w_4 = 0.3 \times (1-0.6) \times 0.9$$

$$w_5 = 0.3 \times 0.6 \times (1-0.1)$$

$$w_6 = 0.3 \times 0.6 \times 0.1$$



b) M-Step

$$P(C=1) = \frac{w_4 + w_5 + w_6 + 1}{6}$$

$$P(B=1 | A=1) = \frac{w_5 + w_6 + 1}{w_4 + w_5 + w_6 + 1}$$

$$P(B=1 | A=0) = \frac{w_1 + w_2 + 1}{w_1 + w_2 + w_3 + 2}$$

$$P(C=1 | B=1) = \frac{w_2 + 1 + w_6 + 1}{w_1 + w_2 + 1 + w_5 + w_6 + 1}$$

$$P(C=1 | B=0) = \frac{w_3 + w_4}{w_3 + w_4 + 1}$$