

1. Consider the Bayes net shown in Figure 1. Write answers with a scale of 4, i.e., 01.234.

1. Calculate the value of $P(b, i, \neg m, g, j)$.

$$\begin{aligned} P(b, i, \neg m, g, j) &= P(b) \cdot P(\neg m) \cdot P(i|b, \neg m) \cdot P(g|b, i, \neg m) \cdot P(j|g) \\ &= (.9) \cdot (.8) \cdot (.5) \cdot (.8) \cdot (.8) \\ &= .2304 \end{aligned}$$

2. Calculate the value of $\vec{P}(J|b, i, m)$.

$$\begin{aligned} \vec{P}(J|b, i, m) &= \alpha \cdot \vec{P}(J, b, i, m) \\ &= \alpha \cdot \sum_{g'} \vec{P}(J, b, i, m, g') \\ &= \alpha \cdot \sum_{g'} \vec{P}(J|g') \cdot P(g'|b, i, m) \cdot P(b) \cdot P(i) \cdot P(m) \\ &= \beta \cdot \sum_{g'} \vec{P}(J|g') \\ &= \beta \cdot ([P(j|g), P(\neg j|g)] + [P(j|\neg g), P(\neg j|\neg g)]) \\ &= \beta \cdot ([.8, .2] + [.1, .9]) \\ &= \beta \cdot ([.9, 1.1]) \\ &= [.45, .55] \end{aligned}$$

3. Calculate the value of $\vec{P}(J|\neg b, \neg i, m)$.

$$\begin{aligned} \vec{P}(J|\neg b, \neg i, m) &= \alpha \cdot \vec{P}(J, \neg b, \neg i, m) \\ &= \alpha \cdot \sum_{g'} \vec{P}(J, \neg b, \neg i, m, g') \\ &= \alpha \cdot \sum_{g'} \vec{P}(J|g') \cdot P(\neg b) \cdot P(\neg i) \cdot P(m) \cdot P(g'|\neg b, \neg i, m) \\ &= \beta \cdot \sum_{g'} \vec{P}(J|g') \\ &= \beta \cdot ([P(j|g), P(\neg j|g)] + [P(j|\neg g), P(\neg j|\neg g)]) \\ &= [.45, .55] \end{aligned}$$