

COMP 6721 - Artificial Intelligence Stochastic Methods

Solutions

Question 1 Assume that a fancy food-store sells wild hand-picked mushrooms from a local farmer. In the store, the mushrooms are labelled as *gourmet*, *good*, or *at-your-own-risk*. The store always keeps the following inventory: 25% of its mushrooms are labeled *gourmet*, 50% are labeled *good*, and 25% are labeled *at-your-own-risk*. Mushrooms labeled as *gourmet* have a 5% chance of being poisonous, a *good* mushroom has a 15% chance of poisoning someone, and a *at-your-own-risk* mushroom has a 25% chance.

If Jim bought a mushroom from the store and was poisoned,

(a) What is the probability that the mushroom had been labeled *gourmet*?

Given:

$$P(\textit{gourmet}) = 0.25$$

$$P(\textit{good}) = 0.5$$

$$P(\textit{ayor}) = 0.25$$

$$P(\textit{poisonous}|\textit{gourmet}) = 0.05$$

$$P(\textit{poisonous}|\textit{good}) = 0.15$$

$$P(\textit{poisonous}|\textit{ayor}) = 0.25$$

$$C_i \in \{\textit{gourmet}, \textit{good}, \textit{at-your-own-risk}\}$$

$$\begin{aligned} P(\textit{poisonous}) &= \sum P(\textit{poisonous}|C_i) * P(C_i) \\ &= 0.05 * 0.25 + 0.15 * 0.5 + 0.25 * 0.25 \\ &= 0.15 \end{aligned}$$

$$\begin{aligned} P(\textit{gourmet}|\textit{poisonous}) &= \frac{P(\textit{poisonous}|\textit{gourmet}) * P(\textit{gourmet})}{P(\textit{poisonous})} \\ &= \frac{0.05 * 0.25}{0.15} \\ &= 0.083 \end{aligned}$$

(b) What is the probability that the mushroom had been labeled *good*?

$$\begin{aligned}P(\textit{good}|\textit{poisonous}) &= \frac{P(\textit{poisonous}|\textit{good}) * P(\textit{good})}{P(\textit{poisonous})} \\&= \frac{0.15 * 0.5}{0.15} \\&= 0.5\end{aligned}$$

(c) What is the probability that the mushroom had been labeled *at-your-own-risk*?

$$\begin{aligned}P(\textit{ayor}|\textit{poisonous}) &= \frac{P(\textit{poisonous}|\textit{ayor}) * P(\textit{ayor})}{P(\textit{poisonous})} \\&= \frac{0.25 * 0.25}{0.15} \\&= 0.417\end{aligned}$$