

## Homework 2 - 2d

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$$\textcircled{1} P(\text{cloudy}) = \langle 0.5, 0.5 \rangle \quad (\text{from the table})$$

$$\begin{aligned} \textcircled{2} P(\text{Sprinkler} \mid \text{cloudy}) &= \propto \sum_a P(S, c) \\ &= \propto \sum_a P(S) \cdot P(C \mid S) \\ &= \propto \langle (0.1 \cdot 0.5), (0.9 \cdot 0.5) \rangle \\ &= \propto \langle \frac{0.05}{0.5}, \frac{0.45}{0.5} \rangle \\ &= \langle 0.1, 0.9 \rangle \end{aligned}$$

$$\begin{aligned} \textcircled{3} P(C \mid S \wedge \neg R) &= \propto \sum_a P(C, S, \neg R) \\ &= \propto \sum_a P(C) \cdot P(S \mid C) \cdot P(\neg R \mid C) \\ &= \propto \langle (0.5 \cdot 0.1 \cdot 0.2), (0.5 \cdot 0.5 \cdot 0.8) \rangle \\ &= \propto \langle \frac{0.01}{0.21}, \frac{0.2}{0.21} \rangle \\ &= \langle 0.0476, 0.9524 \rangle \end{aligned}$$

$$\textcircled{4} P(W \mid C \wedge S \wedge R) = \langle 0.99, 0.01 \rangle \quad (\text{from the table, "disregarding" the cloudy factor since it would have already been accounted for})$$

$$\textcircled{5} P(\text{Cloudy} \mid \neg \text{WetGrass}) = \langle 0.5, 0.5 \rangle \quad (\text{The cloudy variable is independent of whether or not there is wet grass, so its probabilities remain 0.5 and 0.5})$$