AI Quiz 2

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1 (a)

$P(W) = \sum P(W, C=c, R=r, S=s)$

$= \sum_{c, r, s \in T, F} P(W \mid C=c, R=r, S=s) P(R=r, S=s \mid C=c) P(C=c)$

$= (0.99 \times 0.8 \times .1 \times .5)$
$+ (0.9 \times 0.8 \times 0.9 \times 0.5)$
$+ (0 \times 0.2 \ldots) + (0.99 \times 0.2 \times .5 \times .5)$
$+ (.9 \times .2 \times .5 \times .5)$
$+ (.9 \times .8 \times .5 \times .5)$.
$+ (0 \times .8 \times .5)$

$= 0.6471$

now, for,

$P(R, W) = \sum P(W, R, C=c, S=s)$

$= (0.99 \times 0.8 \times .1 \times .5$
$+ (0.9 \times .8 \times .9 \times .5)$
$+ (.99 \times .2 \times .5 \times .5)$

$= 0.4581$

$\therefore P(R \mid W) = 0.4581 / 0.6471 = .7079$.

$P(S \mid W) = \frac{P(S, W)}{P(W)} = \frac{0.2781}{0.6471} = 0.4297$

So, since $P(R \mid W) > P(S \mid W)$, so, it is more likely to rain.

(b) $P(W=1 \text{ or } T)$

$$P(W) = \Sigma P(W, C=c, R=r, S=s)$$

$$= \sum_{c,r,s \in \{T,F\}} P(W \mid C=c, R=r, S=s) \, P(R=r, S=s \mid C=c) P(C=c)$$

$$= \Sigma (P(W \mid R=r, S=s) \, P(R=r \mid C=c) P(S=s \mid C=c) P(C=c))$$

$$= (0.99 \times 0.8 \times .1 \times .5)$$
$$+ (.9 \times .8 \times .9 \times .5) + (.9 \times .2 \times .1 \times .5)$$
$$+ (0 \times 0.2 \ldots) + (.9 \times .2 \times .5 \times .5) + (.9 \times .8 \times .5 \times .5)$$
$$+ (0 \times .8 \times .5 \ldots).$$

$$= 0.6471$$

$$\therefore P(W=T) = 0.6471$$