

ECE 131A HW 1

Lawrence Liu

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Problem 1

(a)

$$\begin{aligned} P[B_0] &= P[A_0]P[B_0|A_0] + P[A_1]P[B_0|A_1] \\ &= \boxed{\frac{1}{2} \cdot (1 - \epsilon_1 + \epsilon_2)} \end{aligned}$$

(b)

We have

$$P[B_1] = 1 - P[B_0] = \frac{1}{2} \cdot (\epsilon_1 + 1 - \epsilon_2)$$

Therefore from Bayes law we have

$$\begin{aligned} P[A_1|B_1] &= \frac{P[B_1|A_1]P[A_1]}{P[B_1]} \\ &= \frac{1 - \epsilon_2}{\epsilon_1 + 1 - \epsilon_2} \end{aligned}$$

$$\begin{aligned}
 P[A_0|B_1] &= \frac{P[B_1|A_0]P[A_0]}{P[B_1]} \\
 &= \frac{\epsilon_1}{\epsilon_1 + 1 - \epsilon_2}
 \end{aligned}$$

Therefore we have for $\epsilon_1 = 0.25$ and $\epsilon_2 = 0.5$: we will have

$$\begin{aligned}
 P[A_1|B_1] &= \frac{1 - 0.5}{0.25 + 1 - 0.5} \\
 &= \frac{2}{3} \\
 P[A_0|B_1] &= \frac{0.25}{0.25 + 1 - 0.5} \\
 &= \frac{1}{3}
 \end{aligned}$$

Therefore A_1 will be more likely.

Problem 2

(a)

(i)