

Q3-)

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π = probability of selecting coin A
 p_A = probability of heads for coin A
 p_B = probability of heads for coin B

→ Firstly we initialize values for π , p_A and p_B randomly or based on knowledge.

E-Step: Compute

→ Compute likelihood of the observed data for each coin

$$P(\text{data}|A) = p_A^{\#H} (1-p_A)^{\#T}$$

$$P(\text{data}|B) = p_B^{\#H} (1-p_B)^{\#T}, \text{ where } \begin{cases} \#H = \text{number of heads in seq.} \\ \#T = \text{number of tails in seq.} \end{cases}$$

→ Compute posterior probabilities for each coin using Bayes' Rule:

$$P(A|\text{data}) = \frac{\pi P(\text{data}|A)}{\pi P(\text{data}|A) + (1-\pi) P(\text{data}|B)}$$

$$P(B|\text{data}) = 1 - P(A|\text{data})$$

M-Step: Updating parameters

$$\pi = \frac{\sum_{\text{seq}} P(A|\text{data})}{\text{Total sequence number}}$$

Update p_A and p_B :

$$p_A = \frac{\sum_{\text{seq}} P(A|\text{data}) \#H}{\sum_{\text{seq}} P(A|\text{data}) (\#H + \#T)}$$

$$p_B = \frac{\sum_{\text{seq}} P(B|\text{data}) \#H}{\sum_{\text{seq}} P(B|\text{data}) (\#H + \#T)}$$

Last step is checking for convergence.