AI1110 Assignment 2 in LaTeX

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12.13.6.16: Bag I contains 3 red balls and 4 black balls and Bag II contains 4 red and 5 black balls. One ball is transfered from Bag I to Bag II and then a ball is drawn from Bag II. The ball so drawn is found to be red in colour. Find the probability that the transfered ball is black.

Solution:

Let us first assume A denote the events that a red ball is transferred from bags I to II and B denote the event that a black ball is transferred from bags I to II.

$$\Pr(A) = \frac{3}{7} \tag{1}$$

$$\Pr(B) = \frac{4}{7} \tag{2}$$

Let X be the event that the drawn ball is red,

• when the red ball is transferred from Bag I to Bag II

$$\Pr(X|A) = \frac{5}{10} \tag{3}$$

$$\implies \Pr(X|A) = \frac{1}{2} \tag{4}$$

• when the black ball is transferred from Bag I to Bag II

$$\Pr(X|B) = \frac{4}{10} \tag{5}$$

$$\implies \Pr(X|B) = \frac{2}{5} \tag{6}$$

Hence, the probability of the event that transferred ball is black given that the drawn ball is red

$$\Pr(B|X) = \frac{\Pr(B) \times \Pr(X|B)}{\Pr(A) \times \Pr(X|A) + \Pr(B) \times \Pr(X|B)} \tag{7}$$

$$\implies \Pr(B|X) = \frac{\frac{4}{7} \times \frac{2}{5}}{\frac{3}{7} \times \frac{1}{2} + \frac{4}{7} \times \frac{2}{5}} \tag{8}$$

$$\implies \Pr(B|X) = \frac{16}{31} \tag{9}$$

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