AI 1103 - Assignment 7

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Download all python codes from

https://github.com/rohanthota/Assignment_7/codes/Assignment_7.py

and latex codes from

https://github.com/rohanthota/Assignment_7/Assignment 7.tex

Question

Four red balls, four green balls and four blue balls are put in a box. Three balls are pulled out of the box at random one after another without replacement. The probability that all the three balls are red is

Solution

Each ball has an equal probability to be picked.

Defining random variable $X \in \{0, 1, 2\}$ (0.0.1)

$X = 0$ when red is picked first time (0.0.2)

$X = 1$ when red is picked second time. (0.0.3)

$X = 2$ when red is picked third time. (0.0.4)

$$\Pr(X = 0) = \frac{4}{12} \tag{0.0.5}$$

$$\Pr\left(X = 1 \,\middle|\, X = 0\right) = \frac{3}{11} \tag{0.0.6}$$

$$\Pr\left(X = 2 \,\middle|\, (X = 1 \mid X = 0)\right) = \frac{2}{10} \tag{0.0.7}$$

$$\Pr\left(X = 0, \left(X = 1 \,\middle|\, X = 0\right), \left(X = 2 \,\middle|\, X = 1 \mid X = 0\right)\right)$$
$$= \frac{1}{3} \times \frac{3}{11} \times \frac{1}{5} = \frac{1}{55} = 0.0181819 \tag{0.0.8}$$