

Assignment 2

AI1110: Probability and Random Variables

Indian Institute of Technology Hyderabad

Aditya Garg
CS22BTECH11002
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11.16.1.12: One urn contains two black balls (labelled B1 and B2) and one white ball. A second urn contains one black ball and two white balls (labelled W1 and W2). Suppose the following experiment is performed. One of the two urns is chosen at random. Next a ball is randomly chosen from the urn. Then a second ball is chosen at random from the same urn without replacing the first ball.

- Write the sample space showing all possible outcomes
- What is the probability that two black balls are chosen?
- What is the probability that two balls of opposite colour are chosen?

Solution:

Probability of an event E , written as $\Pr(E)$

$$P(E) = \frac{\text{Number of outcomes favourable to } E}{\text{Total Number of possible outcomes in sample space}} \quad (1)$$

Let the white ball in first urn be 'W' and the black ball in second urn be 'B'.

- Sample Space S:

$$\{B_1B_2, B_2B_1, B_1W, WB_1, B_2W, WB_2, W_1W_2, W_2W_1, W_1B, BW_1, W_2B, BW_2\} \quad (2)$$

$$\therefore n(S) = 12 \quad (3)$$

- Let E be event that 2 black balls are chosen, The favourable outcomes are $\{B_1B_2, B_2B_1\}$

$$\Pr(E) = \frac{2}{12} \quad (4)$$

$$= \frac{1}{6} \quad (5)$$

$$\therefore \Pr(E) = \frac{1}{6} \quad (6)$$

- Let E be event that balls of opposite colours are chosen, The favourable outcomes are $\{B_1W, WB_1, B_2W, WB_2, W_1B, BW_1, W_2B, BW_2\}$

$$\Pr(E) = \frac{8}{12} \quad (7)$$

$$= \frac{2}{3} \quad (8)$$

$$\therefore \Pr(E) = \frac{2}{3} \quad (9)$$