AI1110: Probability and Random Variable Assignment-1

Mayank Parasramka*
AI22BTECH11018

Question: 12.13.2.5

Problem Statement:
A die marked 1, 2, 3 in red and 4, 5, 6 in green is tossed. Let A be the event,'the number is even,' and B be the event, 'the number is red'. Are A and B independent?
Solution:
Given,
'S'= Sample space = $\{1,2,3,4,5,6\}$
'A'= Event that number is even = $\{2,4,6\}$
'B'= Event that number is red = $\{1,2,3\}$

$$n(A) = 3$$
$$n(B) = 3$$
$$n(S) = 6$$
$$n(AB) = 1$$

Now,

$$\Pr(A) = \frac{n(A)}{n(S)} = \frac{3}{6} = \frac{1}{2}$$
$$\Pr(B) = \frac{n(B)}{n(S)} = \frac{3}{6} = \frac{1}{2}$$
$$\Pr(AB) = \frac{n(AB)}{n(S)} = \frac{1}{6}$$

Now,

$$\Pr(A) \times \Pr(B) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

$$\implies \Pr(AB) \neq \Pr(A) \times \Pr(B)$$

Hence, A and B are not independent.

*The student is with the Department of Artificial Intelligence, Indian Institute of Technology, Hyderabad, 502285, India.
e-mail: ai22btech11018@iith.ac.in.