Assignment 1

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Download all python codes from

https://github.com/manik2255/AI1103−PROBABILITY−AND−RANDOM−VARIABLES/blob/main/code.py

and latex-tikz codes from

https://github.com/manik2255/AI1103−PROBABILITY−AND−RANDOM−VARIABLES/blob/main/ASSIGNMENT_1.tex

1 PROBLEM 6.14

Events A and B are such that $P(A) = \frac{1}{2}$, $P(B) = \frac{7}{12}$ and $P(\textit{not } A \textit{ or not } B) = \frac{1}{4}$. State whether A and B are independent ?

2 SOLUTION

$$P(\textit{not } A \textit{ or not } B) = P(A' + B') \tag{2.0.1}$$

We know that,

$$P(A' + B') = P((AB)') \tag{2.0.2}$$

As,

$$(AB)(AB)' = 0 \tag{2.0.3}$$
$$P(AB) + P((AB)') = 1 \tag{2.0.4}$$
$$P(AB) = 1 - P((AB)') \tag{2.0.5}$$

Using (2.0.2) in (2.0.5), We get

$$P(AB) = 1 - P(A' + B') \tag{2.0.6}$$

On substituting the value of P(A' + B') in (2.0.6), we get

$$P(AB) = 1 - \frac{1}{4} \tag{2.0.7}$$
$$\implies P(AB) = \frac{3}{4} \tag{2.0.8}$$

Given,

$$P(A) = \frac{1}{2} \textit{ and } P(B) = \frac{7}{12} \tag{2.0.9}$$
$$\implies P(A)P(B) = \frac{7}{24} \tag{2.0.10}$$

From (2.0.8) and (2.0.9),

$$P(AB) \neq P(A)P(B) \tag{2.0.11}$$

As the events A and B does not satisfy the definition of independent events,
$\therefore$ Events A and B are dependent.