Assignment 1

MANIKANTA VALLEPU - AI20BTECH11014

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

2 SOLUTION

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

We know that,

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

As,

$$(AB)(AB)' = 0 \tag{2.0.3}$$

$$\Pr(AB) + \Pr((AB)') = 1 \tag{2.0.4}$$

$$\Pr(AB) = 1 - \Pr((AB)') \tag{2.0.5}$$

Using 2.0.2 in 2.0.5, We get

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

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

$$\Pr(AB) = 1 - \frac{1}{4} \tag{2.0.7}$$

$$\implies \Pr(AB) = \frac{3}{4} \tag{2.0.8}$$

Given, $\Pr(A) = \frac{1}{2}$ *and* $\Pr(B) = \frac{7}{12}$

$$\implies \Pr(A)\Pr(B) = \frac{7}{24} \tag{2.0.9}$$

From 2.0.8 and 2.0.9,

$$\Pr(AB) \neq \Pr(A)\Pr(B) \tag{2.0.10}$$

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