AI1103-Assignment 5

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Latex codes :

https://github.com/Aayush−2492/Assignments/tree/
 main/Assignment5

QUESTION 29

Two random variables X and Y are distributed according to

$$f_{X,Y}(x, y) = \begin{cases} x + y & 0 \le x \le 1, 0 \le y \le 1 \\ 0 & otherwise \end{cases}$$

The probability $Pr(X + Y \le 1)$ is

SOLUTION

$$Pr(X + Y \le 1) = \int_0^1 \int_0^{1-y} f_{X,Y}(x, y)\, dx\, dy \quad (0.0.1)$$

$$= \int_0^1 \int_0^{1-y} (x + y)\, dx\, dy \quad (0.0.2)$$

$$= \int_0^1 \left(\left(\frac{x^2}{2} + xy \right) \Big|_0^{1-y} \right) dy \quad (0.0.3)$$

$$= \int_0^1 \left(\frac{1 - y^2}{2} \right) dy \quad (0.0.4)$$

$$= \left(\frac{y}{2} - \frac{y^3}{6} \right) \Big|_0^1 dy \quad (0.0.5)$$

$$= \frac{1}{3} \quad (0.0.6)$$

Therefore, required probability is $= \dfrac{1}{3}$