

AI1103 Assignment 2

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Download all python codes from

https://github.com/Sandeep-L/AI1103_2/blob/main/Assignment_2_AI1103.py

and latex-tikz codes from

https://github.com/Sandeep-L/AI1103_2/blob/main/Assignment_2_AI1103.tex

72 QUESTION

Let $\Omega = (0, 1]$ be the sample space and let $P(\cdot)$ be a probability function defined by

$$P((0, x]) = \begin{cases} \frac{x}{2} & 0 \leq x < \frac{1}{2} \\ x & \frac{1}{2} \leq x \leq 1 \end{cases}$$

Then $P\left(\left\{\frac{1}{2}\right\}\right)$ is equal to.....

SOLUTION

Let X be a random variable and the CDF $F_X(x)$ be defined as

$$F_X(x) = \begin{cases} \frac{x}{2} & 0 \leq x < \frac{1}{2} \\ x & \frac{1}{2} \leq x \leq 1 \end{cases}$$

The probability of getting a number in $\left[0, \frac{1}{2}\right)$, i.e., $x = \frac{1}{2}^-$ is

$$F_X\left(\frac{1}{2}^-\right) = \frac{1}{2} \quad (0.0.1)$$

$$F_X\left(\frac{1}{2}\right) = \frac{1}{4} \quad (0.0.2)$$

The probability of getting a number in $\left[0, \frac{1}{2}\right]$, i.e., $x = \frac{1}{2}$ is

$$F_X\left(\frac{1}{2}\right) = \frac{1}{2} \quad (0.0.3)$$

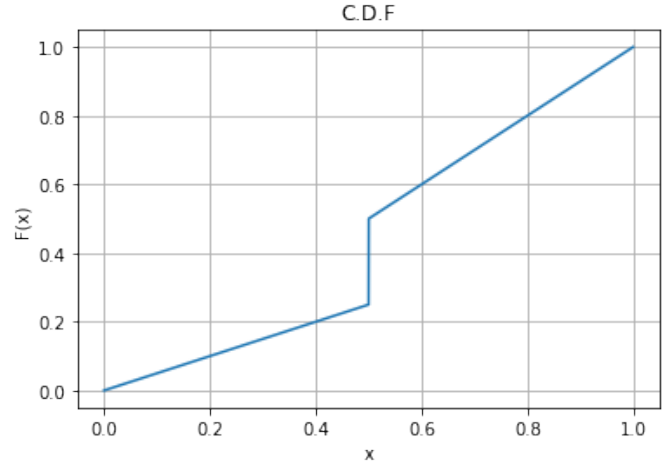


Fig. 0: Graph representing CDF

Therefore, the probability of getting $\left\{\frac{1}{2}\right\}$ is

$$\Pr\left(\left\{\frac{1}{2}\right\}\right) = F_X\left(\frac{1}{2}\right) - F_X\left(\frac{1}{2}^-\right) \quad (0.0.4)$$

$$\Pr\left(\left\{\frac{1}{2}\right\}\right) = \frac{1}{2} - \frac{1}{4} \quad (0.0.5)$$

$$\Pr\left(\left\{\frac{1}{2}\right\}\right) = \frac{1}{4} \quad (0.0.6)$$