Assignment 5

Gorantla Pranav Sai- CS20BTECH11018

Download all python codes from

https://github.com/pranav-159/ai1103_Probability_and_Random_variables/blob/main/Assignment_5/codes/experimentalVerification_GATE_MA_2016_Q10.py

latex-tikz codes from

https://github.com/pranav-159/ai1103_Probability_and_Random_variables/blob/main/Assignment_5/Assignment5.tex

1 Problem(GATE 2016 (MA), Q.10)

Let the probability density function of a random variable X be

$$f(x) = \begin{cases} x & 0 \leqslant x < \frac{1}{2} \\ c(2x-1)^2 & \frac{1}{2} \leqslant x < 1 \\ 0 & \text{Otherwise} \end{cases}$$

Then value of c is equal to ...

2 Solution(GATE 2016 (MA), Q.10)

We know that,

$$\int_{-\infty}^{\infty} f_x(x)\,dx = 1 \tag{2.0.1}$$

$$\int_{-\infty}^{0} f_x(x)\,dx + \int_{0}^{\frac{1}{2}} f_x(x)\,dx + \int_{\frac{1}{2}}^{1} f_x(x)\,dx + \int_{1}^{\infty} f_x(x)\,dx = 1 \tag{2.0.2}$$

$$\int_{0}^{\frac{1}{2}} x\,dx + \int_{\frac{1}{2}}^{1} c(2x-1)^2\,dx = 1 \tag{2.0.3}$$

$$\left[\frac{x^2}{2}\right]_0^{\frac{1}{2}} + c\left[\frac{(2x-1)^3}{6}\right]_{\frac{1}{2}}^{1} = 1 \tag{2.0.4}$$

$$\frac{1}{8} + \frac{c}{6} = 1 \tag{2.0.5}$$

$$c = \frac{21}{4} \tag{2.0.6}$$

$\therefore$ Required value of $c = \frac{21}{4}$

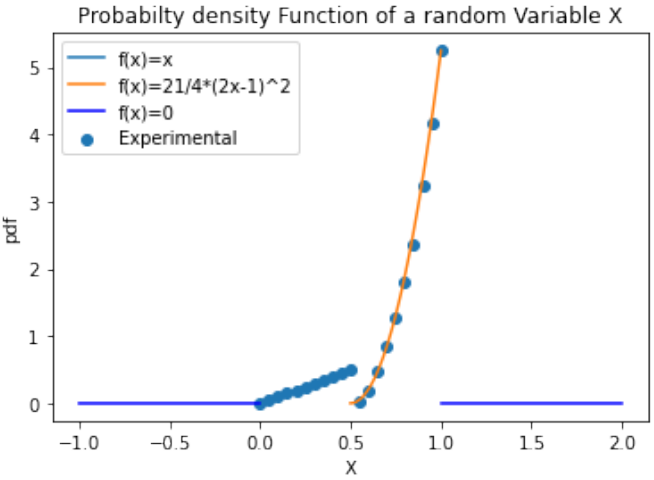

Fig. 0: Experimental and Theoritical pdf