Probability and Random Variables

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Contents

Abstract—This book provides a simple introduction to probability and random variables. The contents are largely based on NCERT textbooks from Class 9-12.

1 Bernoulli Distribution

1.1.

2 Uniform Distribution

2.1. Suppose you drop a die at random on the rectangular region shown in Fig. 2.1.1. What is the probability that it will land inside the circle with diameter 1m?

Solution: In Fig. 2.1.1, the sample size S is the area of the rectangle given by

$$S = 3x2 = 6m^2 \qquad (2.1.1)$$

The event size is the area of the circle given by

$$E = \pi \left(\frac{1}{2}\right)^2 = \frac{\pi}{4}m^2 \qquad (2.1.2)$$

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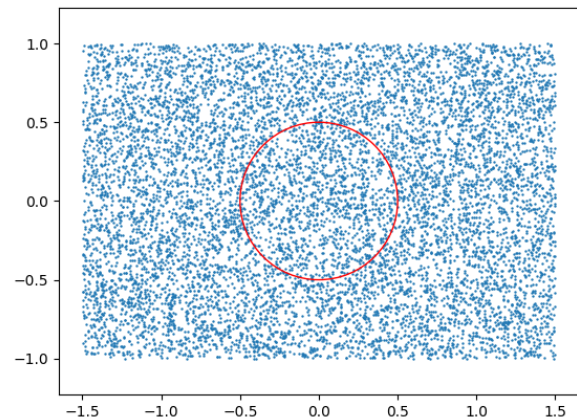
Fig. 2.1.1

The probabilty of the dice landing in the circle is

$$\Pr(E) = \frac{E}{S} = \frac{\pi}{24} \qquad (2.1.3)$$

The python code is available in

/codes/uniform/rect.py

The python code generates 10,000 points uniformly within the rectangle of dimensions 3×2 and checks for the number of points within the circle of radius 0.5. The ratio of these is close to $\frac{\pi}{24}$. Note that each time the code is run, the ratio will change, but will still be close to $\frac{\pi}{24}$.