ASSIGNMENT 6

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Outline

Problem Statement

Papoulis chap 2 Ex 2.12

A call occurs at time t, where t is a random point in the interval (0,10).

- Find $P(6 \leq t \leq 8)$
- Find $P(6 \leq t \leq 8 | t > 5)$

Solution

Bijection

We have bijection between n(0,1) and n(a,a+1). Let assume a function $f : (0, 1) \Rightarrow (a, a + 1)$ as $f(x) = a + x$
Following function is one-one and onto. Therefore it is a bijective function. Hence we have

$$\|(0, 1)\| = \|(a, a + 1)\| \implies n(0, 1) = n(a, a + 1) \tag{1}$$

Part 1

Let n(a,b) define the number of real points between a and b in real number line. Using equation (1) ,we get

$$P(6 \leq t \leq 8) = \frac{n(6, 8)}{n(0, 10)} = \frac{2 \times n(0, 1)}{10 \times n(0, 1)} = \frac{2}{10} = 0.2 \tag{2}$$

Solution

Conditional Probability

The conditional probability of an event A assuming another event M, denoted by $P(A|M)$, is by definition the ratio

$$P(A|M) = \frac{P(AM)}{P(M)} \tag{3}$$

where we assume that $P(M) \neq 0$.
Now, If $A \subseteq B$ then

$$P(A|M) = \frac{P(A)}{P(M)} \tag{4}$$

Part 2

Now, Let A = Event of choosing number between 6 and 8 and M = Event of choosing number greater than 5

Soltuion

Continued . . .

Since $A \subset M$, Using Equation (3) and (4), we have

$$P(A|M) = \frac{P(AM)}{P(M)} = \frac{P(A)}{P(M)} = \frac{P(6 \leq t \leq 8)}{P(t > 5)} \tag{5}$$

we have,

$$P(t > 5) = \frac{n(5, 10)}{n(0, 10)} = \frac{5 \times n(0, 1)}{10 \times n(0, 1)} = 0.5 \tag{6}$$

Therefore, Using equation (2) and (6), we get

$$P(A|M) = \frac{P(6 \leq t \leq 8)}{P(t > 5)} = \frac{0.2}{0.5} = 0.4 \tag{7}$$

Python Code