3 : Basic Statistics

IT5506 – Mathematics for Computing II

Level III - Semester 5

Intended Learning Outcomes

At the end of this lesson, you will be able to;

- define uniform random variables are and how they are used.
- compute the mean and the variance of a uniform random variables .
- use and interpret uniform random variables.
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List of sub topics

3.7 The Uniform probability distribution

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- Let a and b be real numbers with a < b. A uniform random variable on the interval [a, b] is, roughly speaking, "equally likely to be anywhere in the interval".
- In other words, its probability density function is constant (say c) on the interval [a, b] (and zero outside the interval). What should the constant value c be?
- It can be shown that c = 1/(b - a), because the p.d.f. should be f(x) = c when a ≤ x ≤ b, and it should satisfy:

$$\int_a^b c.dx = 1 \;\Rightarrow\; c.\left[x\right]_a^b = 1 \;\Rightarrow\; c.(b-a) = 1 \;\Rightarrow\; c = \frac{1}{b-a}$$

3.7 The Uniform probability distribution

- The p.d.f. of the Uniform distribution is

$$f(x) = \begin{cases} 1/(\mathrm{b - a}) & \text{if a } \leq \mathrm{x} \leq b \\ 0 & \text{otherwise} \end{cases}$$

- The Uniform distribution is usually denoted by U(a, b).

3.7 The Uniform probability distribution

- Further calculation (or the symmetry of the p.d.f.) shows that the expected value of Uniform probability distribution is given by

  E(X)=(a + b) = 2 (the midpoint of the interval), and

  V(X) = $\frac{(b-a)^2}{12}$.

- The uniform random variable doesn't really arise in practical situations.
- However, it is very useful for simulations.
- Most computer systems include a random number generator, which apparently produces independent values of a uniform random variable on the interval [0, 1].