CO-1 – Probability
Session-06:
Session Topic: Cumulative Distribution Function

Probability, Statistics and Queueing Theory
(Course code: 21MT2103RA)

(DEEMED TO BE UNIVERSITY)

COMPUTER SCIENCE & ENGINEERING

CO-1

(Probability)

- Introduction to Probability: Sample Space and Events

- Probabilities defined on Events, Conditional Probabilities

- Independent Events, Bayes Formula.

- Random Variables, Probability Distribution Function

- Cumulative Distribution Function

- Discrete Random Variables: Bernoulli, Binomial, and Poisson.

Cumulative Distribution Function (CDF)

Probability distribution function is one way to describe the distribution of a discrete random variable. The cumulative distribution function (CDF) of a random variable is another method to describe the distribution of random variables.

The cumulative distribution function (CDF) of random variable X is defined as

$$F_X(x) = P(X \leq x), \text{ for all } x \in \mathbb{R}.$$

The CDF, F(x), is the probability that the random variable X takes a value less than or equal to x.

CDF

The CDF is always a non-decreasing function. In other words,

if $x1 < x2$, $F(x1) <= F(x2)$

One can show that

$$\mathrm{P}(a < X \leq b) = F_X(b) - F_X(a)$$

The CDF can be defined for any kind of random variable (discrete, continuous, and mixed). When we learn different types of probability distribution functions, we will also state the corresponding CDFs.

CUMULATIVE DISTRIBUTION FUNCTION

The cumulative distribution function of a **discrete random variable** ***X*** , denoted as ***F(x)***, is

$$\boxed{F(x) = P(X \le x) = \sum_{t \le x} f(t) \quad \text{for } -\infty < x < \infty}$$

For a discrete random variable *X*, *F(x)* satisfies the following properties:

$$\boxed{\begin{array}{l} 1)\ 0 \le F(x) \le 1 \\ 2)\ \text{If } x \le y, \text{ then } F(x) \le F(y) \end{array}}$$

References

* https://www.probabilitycourse.com/chapter3/3_2_1_cdf.php

* https://en.wikipedia.org/wiki/Cumulative_distribution_function