Poisson Distribution

Ansar Shahzadi

School of Electrical Engineering & Computer Science

National University of Science and Technology(NUST)

Poisson Distribution

- An approximation to binomial distribution for ***the SPECIAL CASE*** when the probability of success is very small but n, the number trials is so large that the product np =μ is of moderate size.
- If events happen independently of each other, with average number of events in some fixed interval $\boldsymbol{\mu}$, then the distribution of the number of events x in that interval is Poisson.

Examples of Poisson Distribution

- Number of flaws in a given length of material
- Number of accidents per week
- Number of errors occur in a software over some interval of time
- Number of Errors per page a sectary makes in a day

Poisson Distribution

A random variable X has the Poisson distribution with parameter μ(> 0) if

$$P(X = x) = \frac{e^{-\mu}\mu^{x}}{x!} \quad (x = 0,1,2, \dots)$$

Poisson Distribution has one parameter μ.

Mean=μ

Variance=$\sigma^2 = \mu$

Standard Deviation=$\sqrt{\mu}$

Question 1

For the case of the thin copper wire, suppose that the number of flaws follows a Poisson distribution with a mean of 2.3 flaws per millimeter. Determine the probability of

a) At most 2 flaws per millimeter of wire.

b) exactly 2 flaws in 2 millimeter of wire.

Question 2

Suppose that only, 4 percent of all computers of a certain type experience cpu failure during the warranty period. Consider a sample of 1000 computers.

a) What are the expected value and standard deviation of the number of computers in the sample that have the defect?

b) What is the (approximate) probability that at most two sampled computer has defect?

Question 3

On the average, 1 computer in 800 crashes during a severe thunderstorm. A certain company had 4000 working computers when the area was hit by a severe thunderstorm. Compute the probability that

a) less than 5 computers crashed.

b) Exactly two computer crashed

Question 4

The probability that a men aged 50 years will die within a year is 0.01125. what is the probability that of 60 such men at least 59 will reach their fifty first birthday.