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LECTURE- 20

BSc (AG)
2nd Year , IIIrd Sem.
Statistical Methods
AES-213

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Outline of lecture

- Poisson Distribution
- Introduction
- Definition & Formula
- Properties of Poisson Distribution
- Applications of Poisson Distribution
- Suggested Readings & References

Introduction & Definition

- Poisson distribution was discovered by Mathematician Poisson in 1837.
- Let X is a random variable, n is a total number of trials, p is a probability of success.
- If n is a large and p is very small then it is called Poisson distribution.
- Poisson distribution is the limiting form of binomial distribution when,

$$n \to \infty, \quad p \to 0 \ \ such\,that \ \ np = finite\,number$$

Poisson distribution is defined as-

$$P(r) = \frac{e^{-m} m^{r}}{r!}$$

where,

r = 0, 1, 2, 3, 4, ...

P(r) = probability of event will happen exactly r times.

This is called Poisson distribution.

Properties of Poisson distribution

- In Poisson distribution there is only one parameter m.
- In Poisson distribution, mean = m = np
- In Poisson distribution, variance = m = np
- In Poisson distribution standard deviation (S.D.) = $\sqrt{np}$
- In Poisson distribution first moment about mean = 0.
- In Poisson distribution, always mean = variance.

Application or uses of Poisson distribution

- It is used in distribution such as number of telephone calls received per day in a particular company network (like Airtel, Jio, Vodaphone, etc).
- .It is used in distribution such as number of patient admit in any hospital in a day.
- It is used in number of accidents in a city on a particular road.
- It is used in number of printing mistakes in any page of any book.

Example

In a Poisson distribution the value of standard deviation is 25 then find the value of mean.

Solution: by using formula

S.D. = 25

Variance = 25X25

= 625

But in Poisson distribution

Mean = Variance = 625.

Suggested Readings & References

1) Statistical Methods: P.N. Arora, Sumeet Arora & S. Arora; S. Chand & Company Ltd.

2) Fundamental of Mathematical Statistics: S.C. Gupta & V. Kapoor; Sultan Chand & Sons.

3) Statistics: M.R. Spiegel; Schaum's Outline Series, Mc-Graw Hill Publication.

4) Advanced Engineering Mathematics: Erwin Kreyszig; John Wiley & Sons Inc.

5) Elements of Statistics: J.P. Chauhan & S. Kumar; Krishna Publication.

* THANK YOU *