Task 8 Summary

Random Variables:

a variable whose value is unknown or a function that assigns values to each of an experiment's outcomes. Random variables are often designated by letters and can be classified as discrete, which are variables that have specific values, or continuous, which are variables that can have any values within a continuous range.

Binomial distribution (dist. & cont.)

Binomial Distribution Formula

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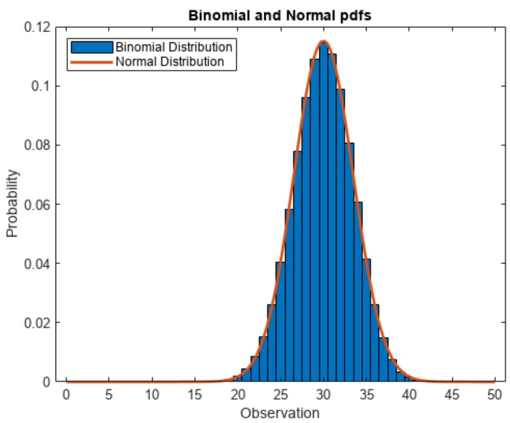
$$P(x) = \binom{n}{x} p^x q^{n-x} = \frac{n!}{(n-x)!\,x!} p^x q^{n-x}$$

where
n = the number of trials (or the number being sampled)
x = the number of successes desired
p = probability of getting a success in one trial
q = 1 - p = the probability of getting a failure in one trial

Binomial Distribution Formula

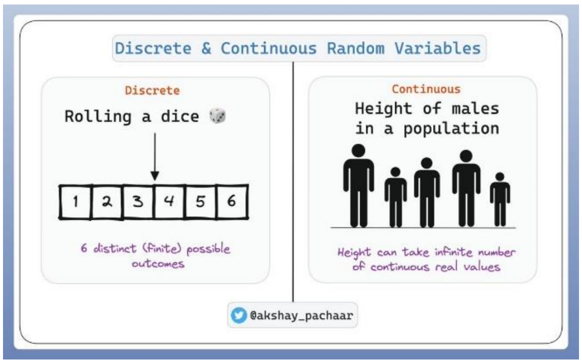
$$P(X) = {}_nC_x\, p^x (1-p)^{n-x}$$

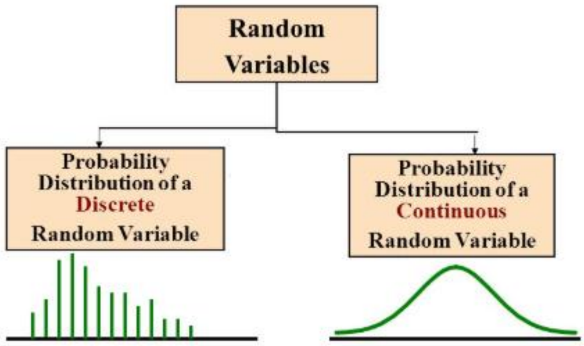
the discrete probability distribution of the number of successes in a sequence of n independent experiments, each asking a yes–no question, and each with its own Boolean-valued outcome: success or failure.



Discrete random variables: random variables take on a countable number of distinct values.

Continuous random variables: random variables can represent any value within a specified range or interval and can take on an infinite number of possible values. Exact probabilities of cont. random variables are equal to 0.





Poisson process

a model for a series of discrete events where the average time between events is known, but the exact timing of events is random. The arrival of an event is independent of the event before

Poisson (n approaches infinity)

the Poisson distribution is just a special case of the binomial, in which the number of n trials grows to infinity and the chance of success in any particular trial approaches zero.

$$(X=k) = \lim_{n\to\infty} \binom{n}{k} p^k (1-p)^{n-k} \qquad p = \frac{\lambda}{n}$$

$$= \lim_{n\to\infty} \binom{n}{k} \left(\frac{\lambda}{n}\right)^k \left(1-\frac{\lambda}{n}\right)^{n-k} \qquad \text{when } n\to\infty,\ p\to$$

$$= \lim_{n\to\infty} \frac{n!}{(n-k)!\,k!} \left(\frac{\lambda}{n}\right)^k \left(1-\frac{\lambda}{n}\right)^n \left(1-\frac{\lambda}{n}\right)^{-k}$$

$$= \lim_{n\to\infty} \frac{n!}{(n-k)!} \frac{1}{n^k} \boxed{\frac{\lambda^k}{k!} \quad e^{-\lambda}} \quad 1$$

Poisson!