

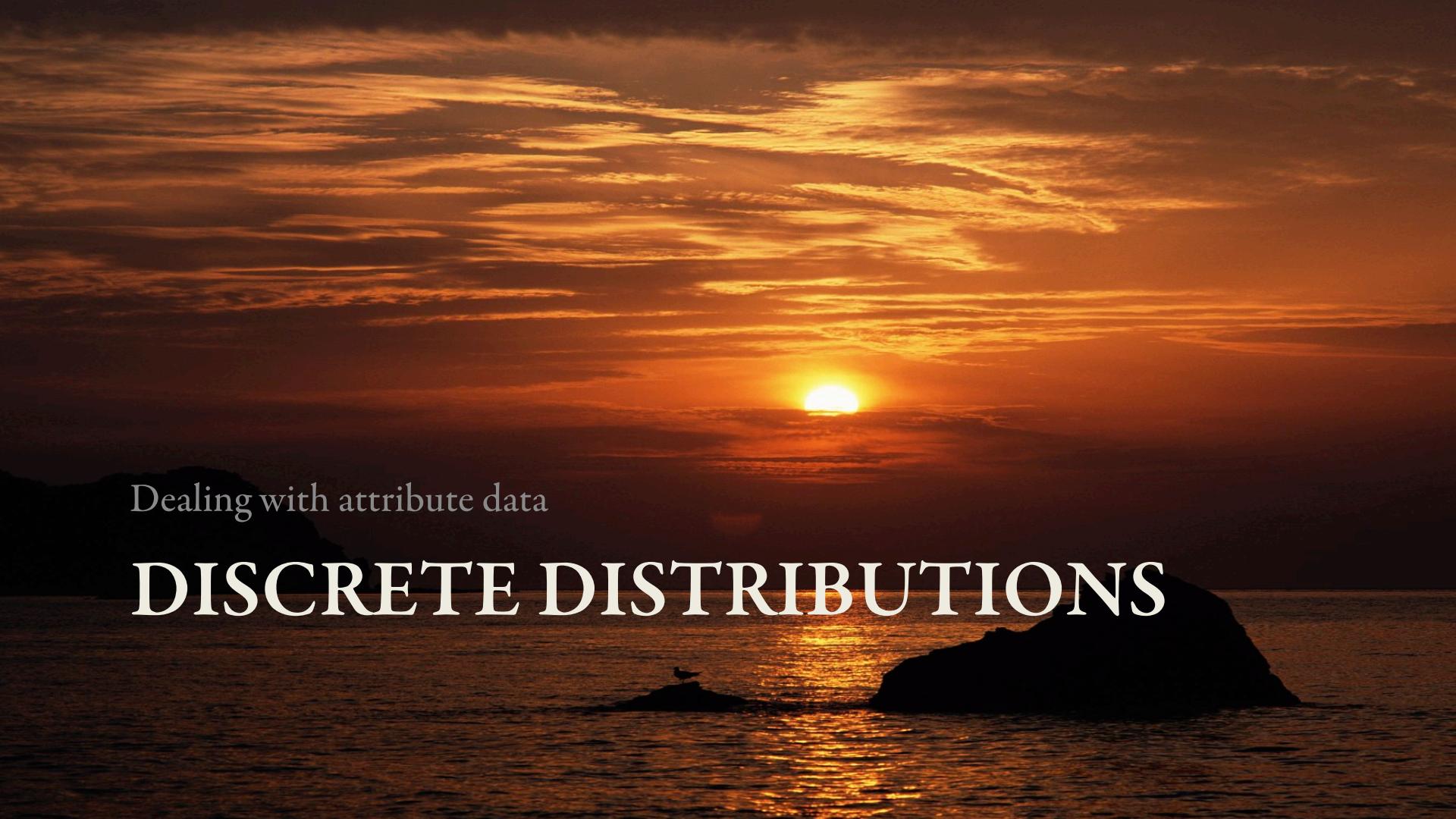


ASQ CRE Prep course

Lesson II. A. 3. c.

Probability Distributions

Discrete Distributions

A wide-angle photograph of a sunset over a calm sea. The sky is filled with horizontal clouds, illuminated from behind by the setting sun, which is a bright orange and yellow orb. In the foreground, the dark silhouettes of two large rocks are reflected in the dark, still water. The overall atmosphere is peaceful and warm.

Dealing with attribute data

DISCRETE DISTRIBUTIONS

Binomial Probability Distribution

n Number of trials

$$n \in \{1, 2, \dots, \infty\}$$

p Probability of success

$$0 \leq p \leq 1$$

$$f(k) = \binom{n}{k} p^k (1-p)^{n-k}$$

$$\binom{n}{k} = C_k^n = \frac{n!}{k!(n-k)!}$$

Binomial Probability Distribution

Use when

- 1. Number of observation, n , is fixed**
- 2. Observations are independent**
- 3. Each observation is a Bernoulli trial**
- 4. Probability of Success, p , is constant**

Binomial Probability Distribution

Check out the tables

**If $n \geq 20$ and $p \leq 0.05$, or
 $n \geq 100$ and $np \leq 10$,
Approximate with Poisson.**

$$F(k) = \sum_{j=0}^k \binom{n}{j} p^j (1-p)^{n-j}$$

$$F(k) \approx e^{-\mu} \sum_{j=0}^k \frac{\mu^j}{j!}, \text{ where } \mu = np$$

**If $np \geq 10$ and $np(1-p) \geq 10$,
Approximate with
Standard Normal**

$$Z = \frac{Y - np}{\sqrt{np(1-p)}}$$

Poisson Probability Distribution

μ Shape Parameter

$$\mu > 0$$

$\mu = \lambda t$ (failure data)

$$f(k) = \frac{\mu^k}{k!} e^{-\mu} = \frac{(\lambda t)^k}{k!} e^{-\lambda t}$$

$$F(k) = e^{-\mu} \sum_{j=0}^k \frac{\mu^j}{j!}$$

Hypergeometric Probability Distribution

**k Success in
n Bernoulli trials from
N population containing
m successes
without replacement**

$$f(k; n, m, N) = \frac{\binom{m}{k} \binom{N-m}{n-k}}{\binom{N}{n}}$$

The mean is $\mu = \frac{nm}{N}$

There are more,
can you deal
with them?



ASQ CRE Prep course

Lesson II. A. 3. d.

Probability Distributions

Bathtub Curve