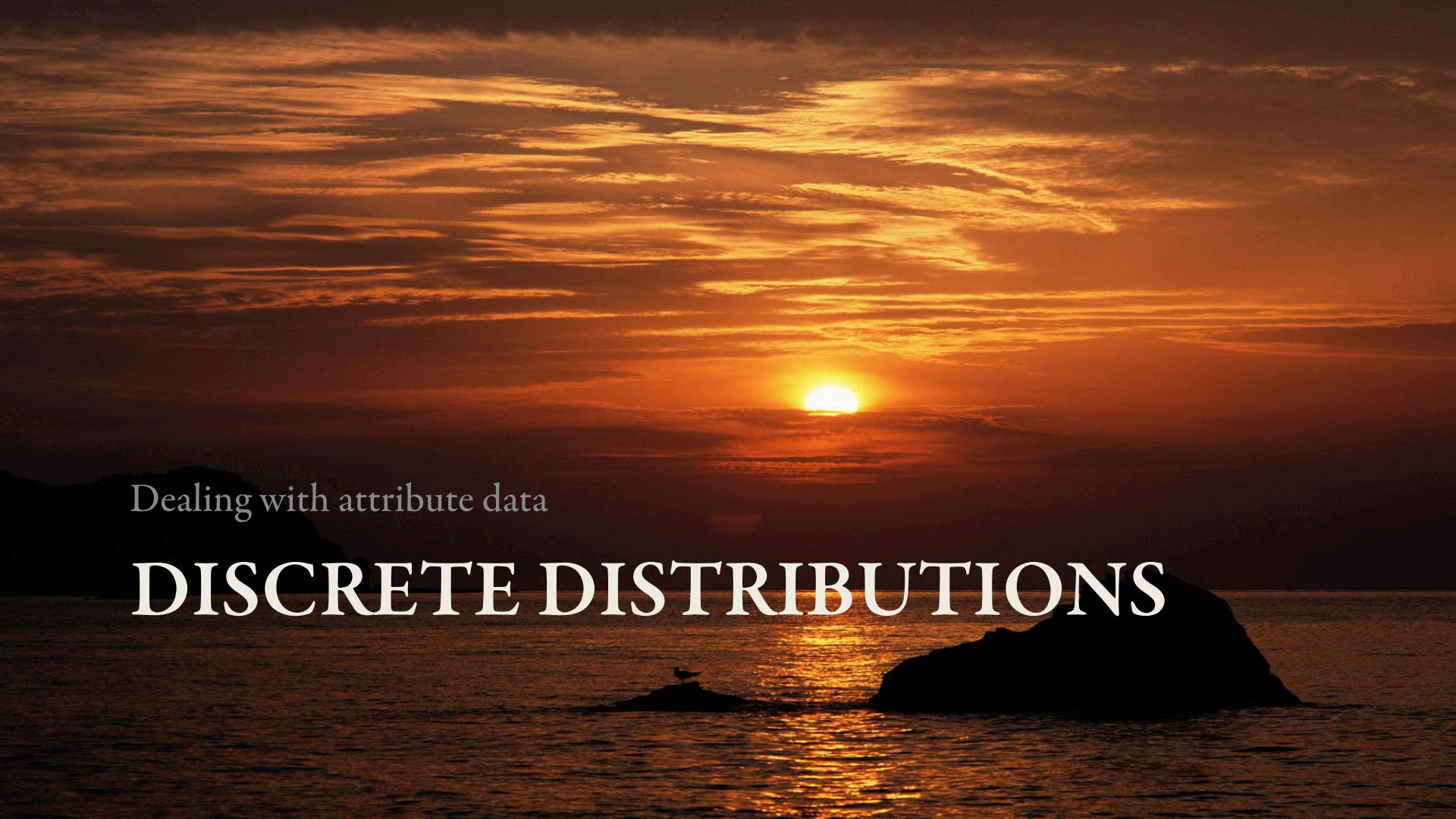
ASQ CRE Prep course

Lesson II. A. 3. c.

Probability Distributions

Discrete Distributions



Dealing with attribute data

DISCRETE DISTRIBUTIONS

Binomial Probability Distribution

n Number of trials

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

p Probability of success

$0 \le p \le 1$

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

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

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

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

If n ≥ 20 and p ≤ 0.05, or n ≥ 100 and np ≤ 10, Approximate with Poisson.

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

If np ≥ 10 and np(1-p) ≥ 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?

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Lesson II. A. 3. d.

Probability Distributions

Bathtub Curve