

Sampling

Statistics

What is a random sample?

$X = (X_1, X_2, \dots, X_n)$ n random variables i.i.d.

What is a statistics?

A statistics is a function of the sample that does not depend on any unknown parameter

Statistics

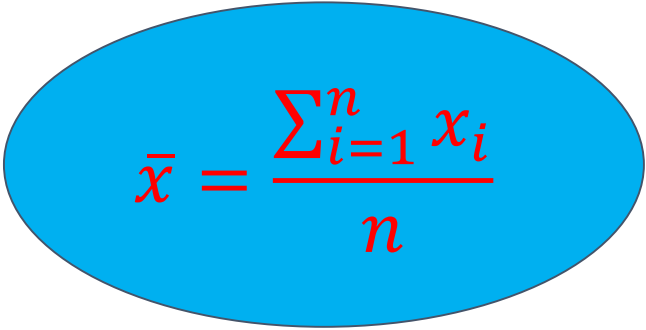
$$\bar{X} = \frac{\sum_{i=1}^n X_i}{n}$$

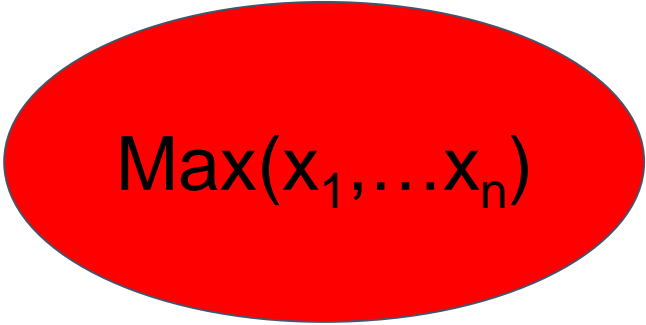
$$\text{Max}(X_1, \dots, X_n)$$

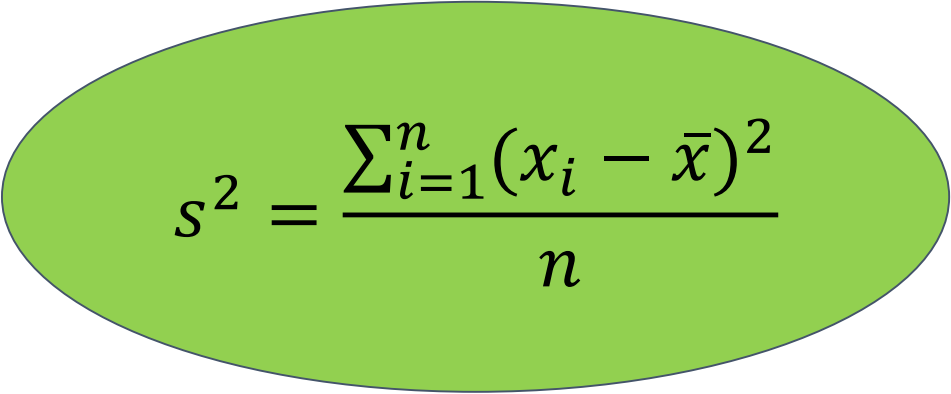
$$S^2 = \frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n}$$

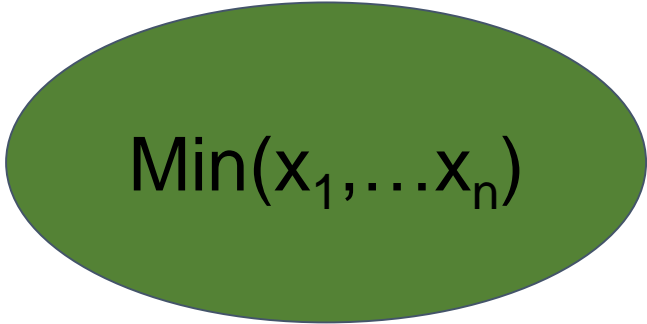
$$\text{Min}(X_1, \dots, X_n)$$

Statistics

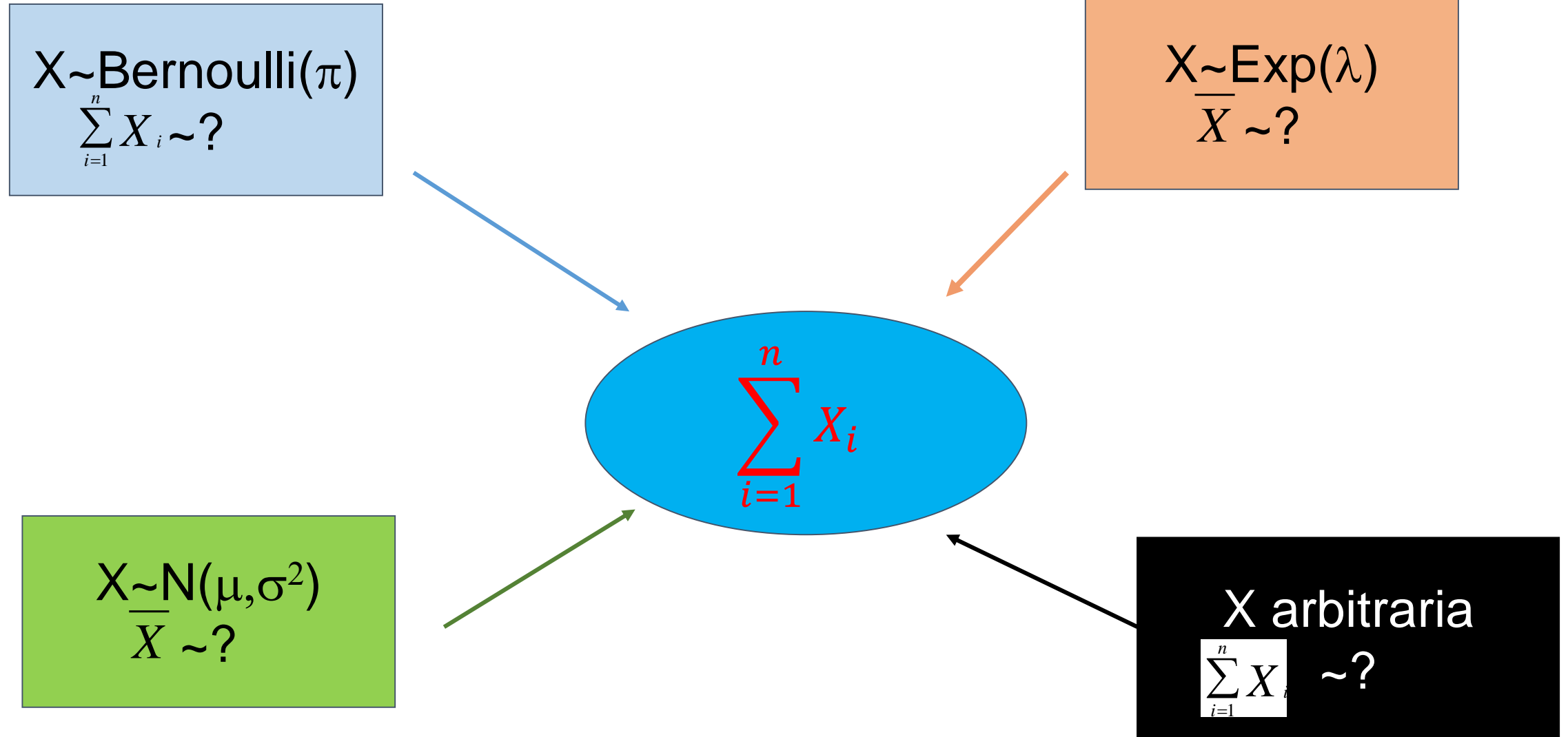

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$


$$\text{Max}(x_1, \dots, x_n)$$


$$s^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$


$$\text{Min}(x_1, \dots, x_n)$$

Distribution sample sum?



Distribution sample sum/sample mean?

$$X \sim \text{Bernoulli}(\pi)$$
$$\sum_{i=1}^n X_i \sim \text{Binomiale}(\pi, n)$$

$$X \sim \text{Exp}(\lambda)$$
$$\sum_{i=1}^n X_i \sim \text{Gamma}(n, 1/\lambda)$$

$$\sum_{i=1}^n X_i$$

$$X \sim N(\mu, \sigma^2)$$
$$\sum_{i=1}^n X_i \sim N(\mu, n\sigma^2)$$

X arbitraria

$$\sum_{i=1}^n X_i \sim N(\mu, n\sigma^2)$$

Distribution of minimum e maximum?

$\text{Min}(X_1, X_2, \dots, X_n)$



$$f_{X_{(1)}}(x) = n [1 - F(x)]^{n-1} f(x)$$

$\text{Max}(X_1, X_2, \dots, X_n)$



$$f_{X_{(n)}}(x) = n [F(x)]^{n-1} f(x)$$

Distribution of minimum e maximum

$X \sim U(a,b)$?

$\text{Min}(X_1, X_2, \dots, X_n)$



$$f_{X_{(1)}}(x) = \frac{n}{b-a} \left[\frac{b-x}{b-a} \right]^{n-1}$$

$\text{Max}(X_1, X_2, \dots, X_n)$



$$f_{X_{(n)}}(x) = \frac{n}{b-a} \left[\frac{x-a}{b-a} \right]^{n-1}$$

Distribution of minimum of X is Exponential?

