STANDARD NORMAL DISTRIBUTION

INFERENTIAL STATISTICS

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TOPIC OUTLINE

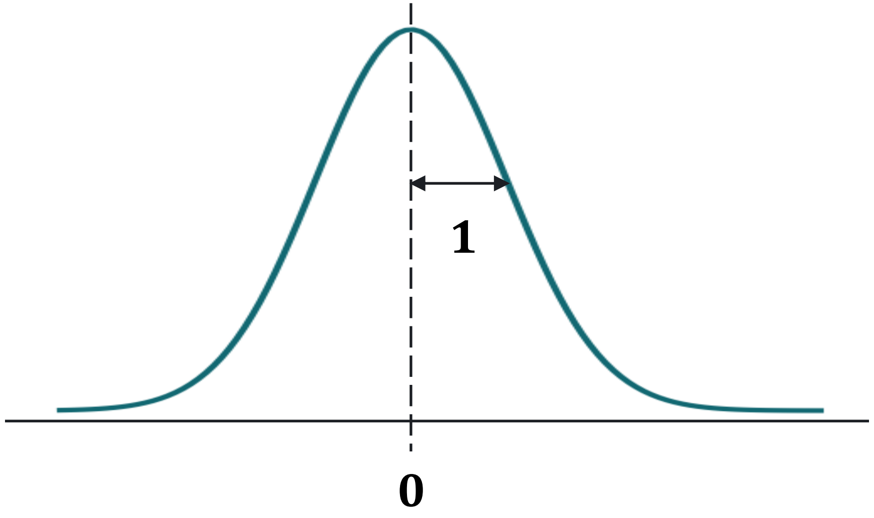
Standard Normal Distribution

Central Limit Theorem

STANDARD NORMAL DISTRIBUTION

STANDARDIZATION

Normal Distribution:



Standardization is the process of converting the distribution of a variable with $\left(\boldsymbol{\mu}, \boldsymbol{\sigma}^{2}\right)$ to a normal distribution $\boldsymbol{N}(\mathbf{0}, \mathbf{1})$.

STANDARD NORMAL DISTRIBUTION

When we standardize the normal distribution $\boldsymbol{N}\left(\boldsymbol{\mu}, \boldsymbol{\sigma}^2\right)$, the result is a **standard normal distribution** $\boldsymbol{z} \sim \boldsymbol{N}(\mathbf{0}, \mathbf{1})$.

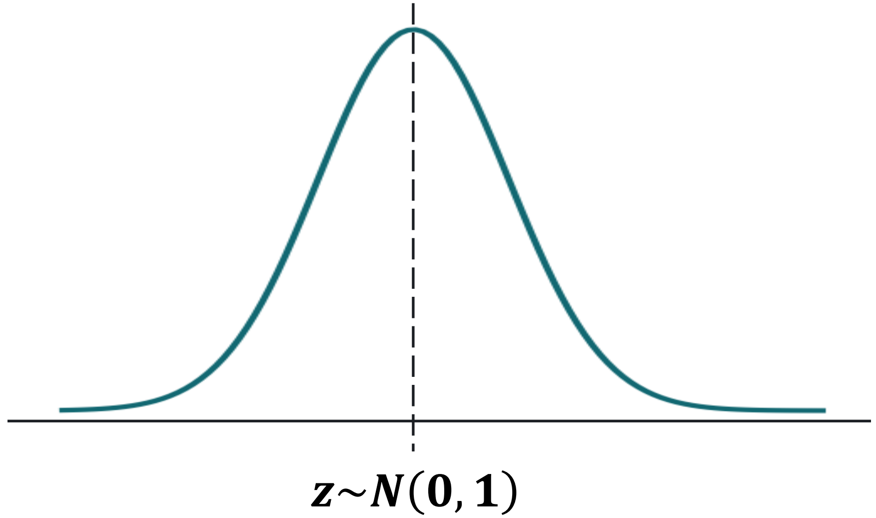
Formula:

$$\boldsymbol{z} = \frac{\boldsymbol{x} - \boldsymbol{u}}{\boldsymbol{\sigma}}$$

where:

$\boldsymbol{z}$ is the z-score

Standard Normal Distribution:



EXERCISE

Convert the given dataset into a **standard normal distribution** $\boldsymbol{N}(\mathbf{0}, \mathbf{1})$ by computing the **z-score** for each data point.

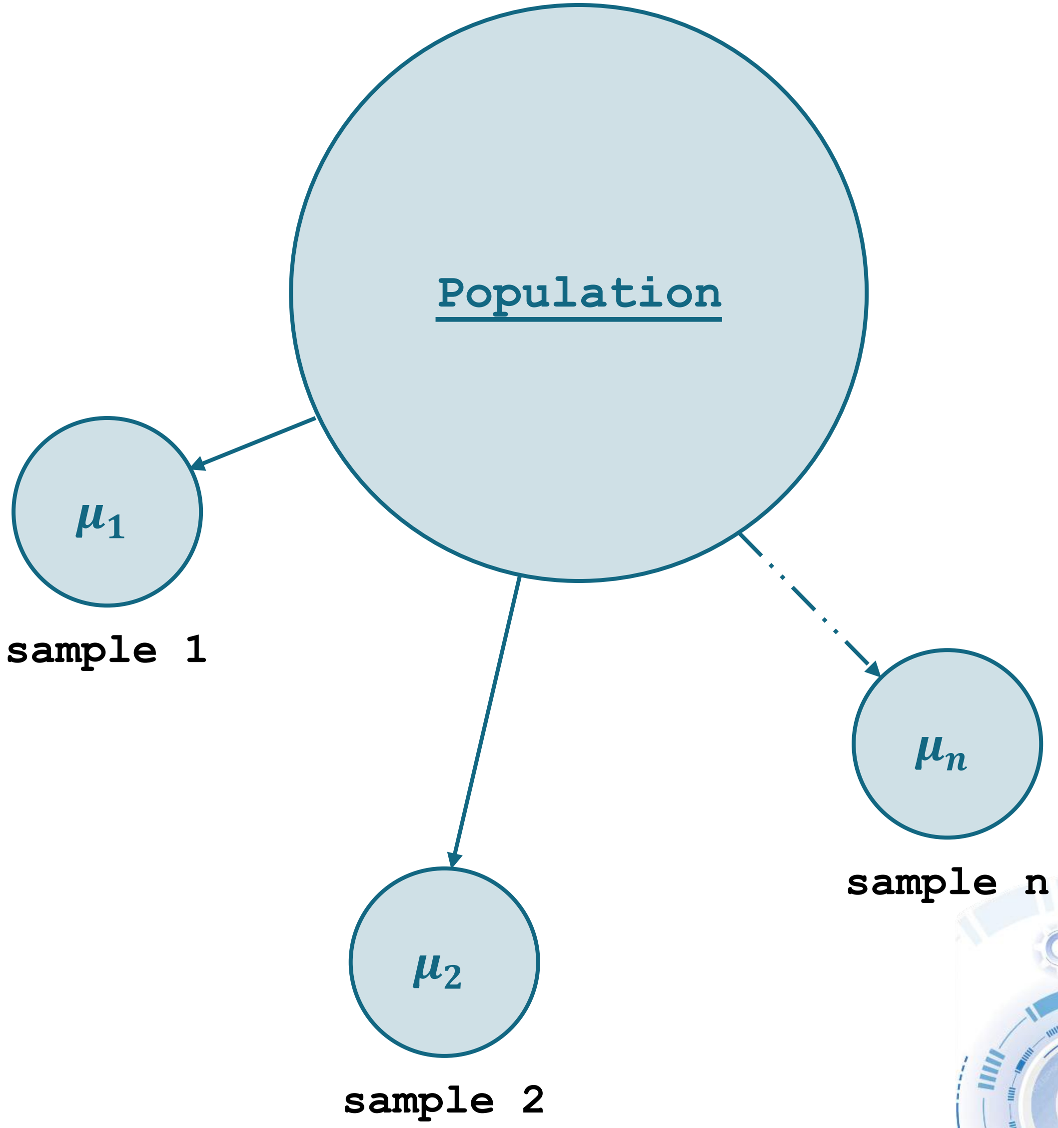
Dataset
1
2
2
3
3
3
4
4
5

Solution:

CENTRAL LIMIT THEOREM

CENTRAL LIMIT THEOREM

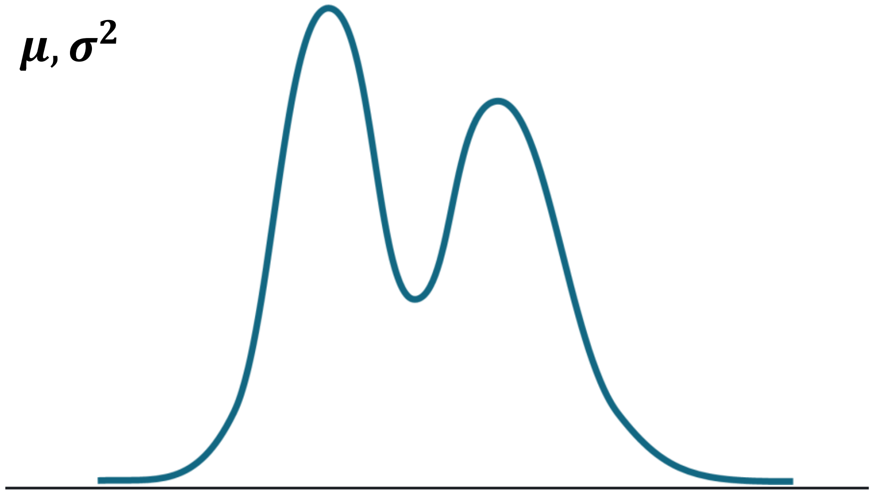
The Central Limit Theorem (CLT) states that the sampling distribution of the **sample mean** will be normally distributed, regardless of the shape of the original population distribution.



CENTRAL LIMIT THEOREM

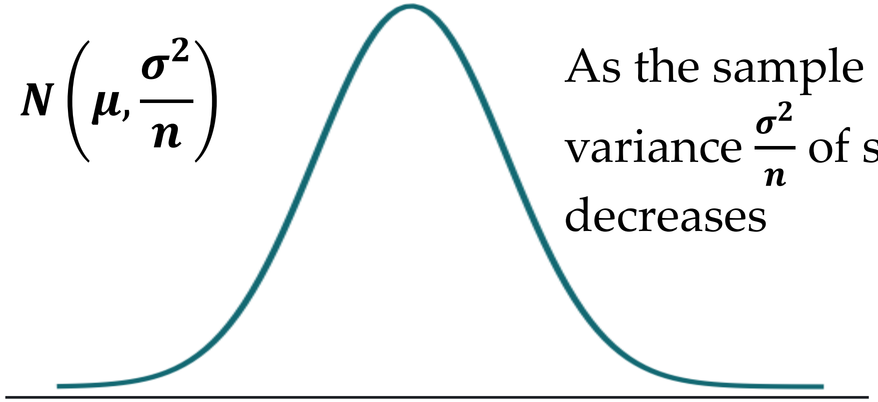
Original Population Distribution:

μ, σ^2

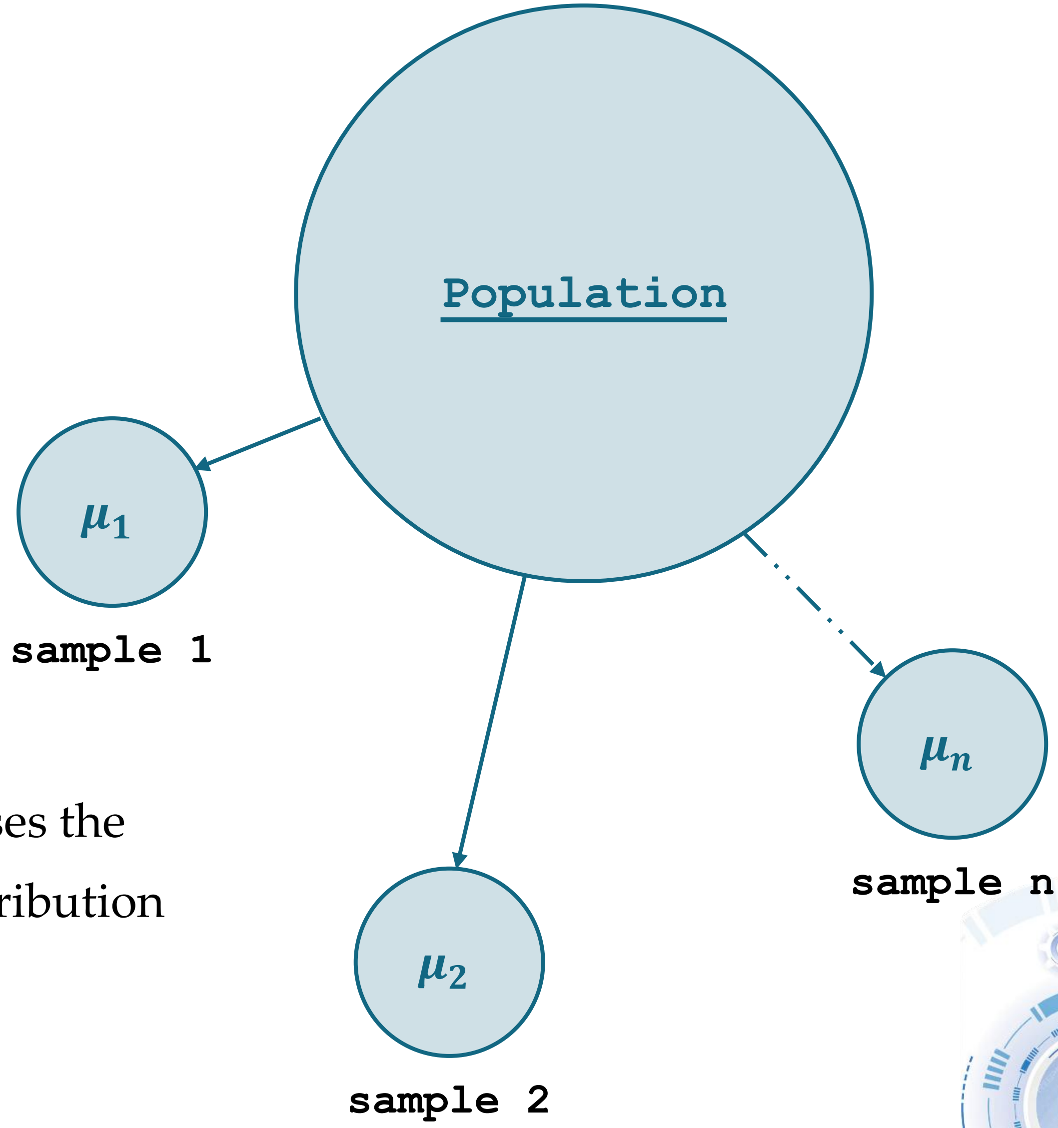


Sampling Distribution:

$N\left(\mu, \frac{\sigma^2}{n}\right)$



As the sample size n increases the variance $\frac{\sigma^2}{n}$ of sampling distribution decreases



SAMPLING DISTRIBUTION

A **sampling distribution** is the probability distribution of a **statistic** (e.g., μ, σ^2) obtained from a large number of samples drawn from a specific population.

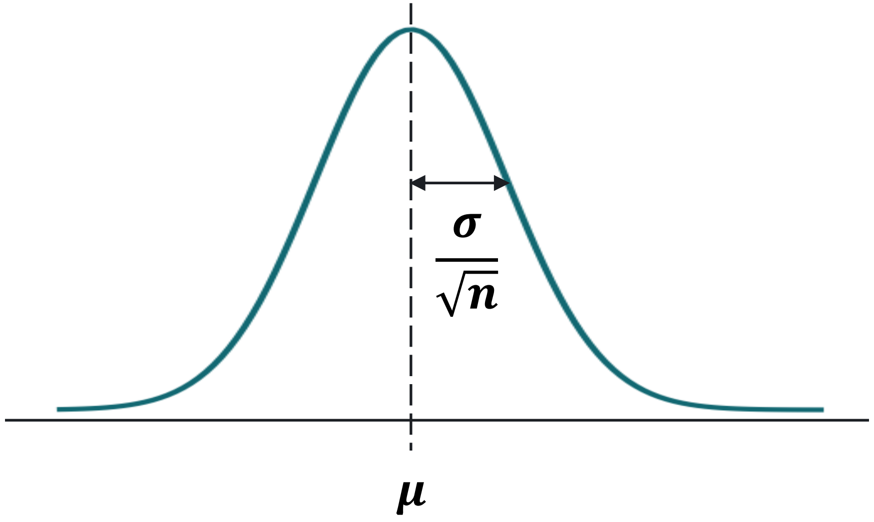
Denoted by:

$$N\left(\mu, \frac{\sigma^2}{n}\right), n > 30$$

where:

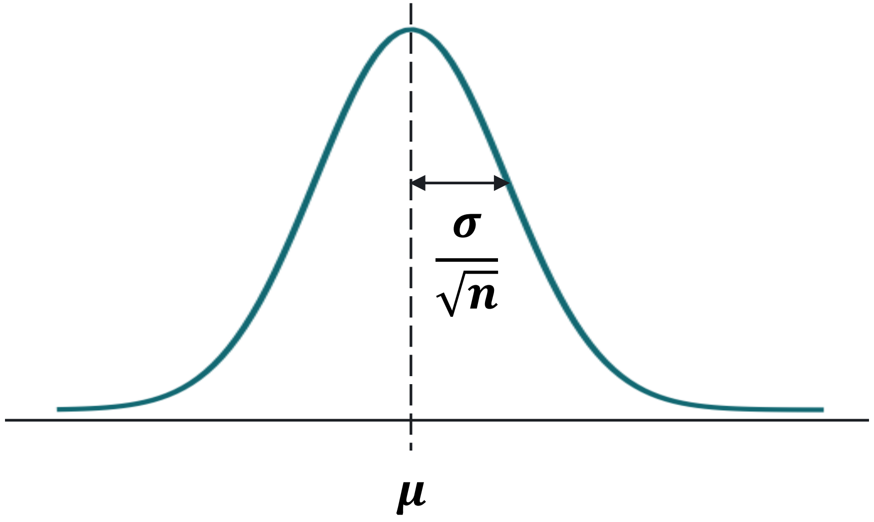
$\frac{\sigma^2}{n}$ is the variance of the sampling distribution

Sampling Distribution:



STANDARD ERROR

Sampling Distribution:



Standard error is the **standard deviation** of the distribution formed by the sample means:

$$N\left(\mu, \frac{\sigma^2}{n}\right)$$

Formula:

$$SE = \frac{\sigma}{\sqrt{n}}$$

LABORATORY