STANDARD NORMAL DISTRIBUTION

INFERENTIAL STATISTICS

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TOPIC OUTLINE

Standard Normal Distribution

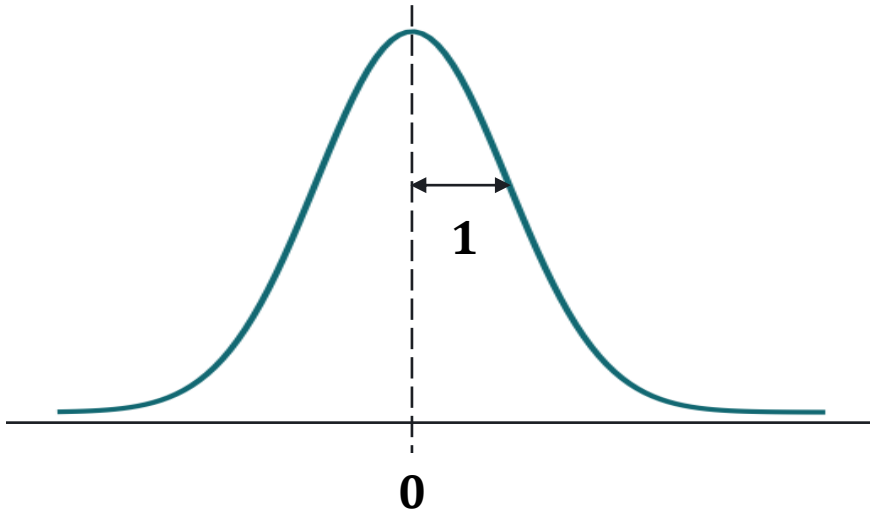
Central Limit Theorem

STANDARD NORMAL DISTRIBUTION

STANDARDIZATION

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

Normal Distribution



STANDARD NORMAL DISTRIBUTION

When we standardize the normal distribution $N(\mu, \sigma^2)$, the result is a **standard normal distribution** $Z \sim N(0, 1)$.

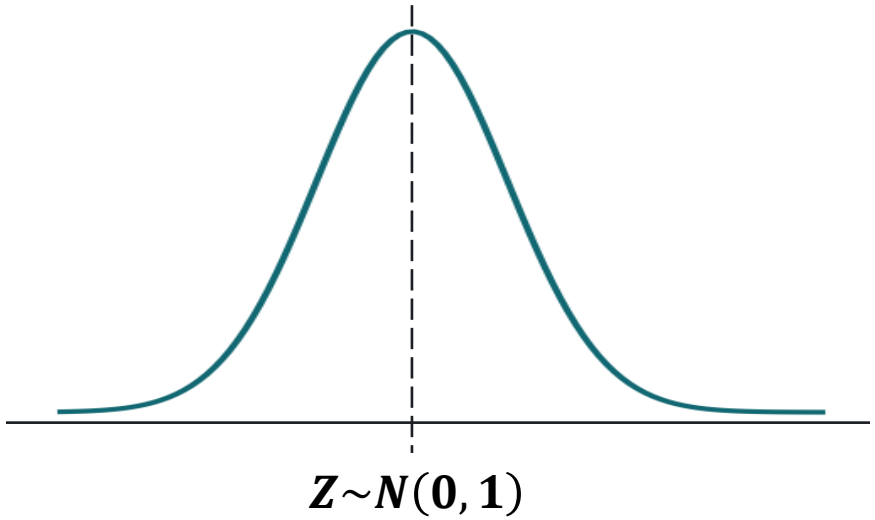
Formula

$$Z = \frac{x - u}{\sigma}$$

where:

Z is the Z-score

Standard Normal Distribution



EXERCISE

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

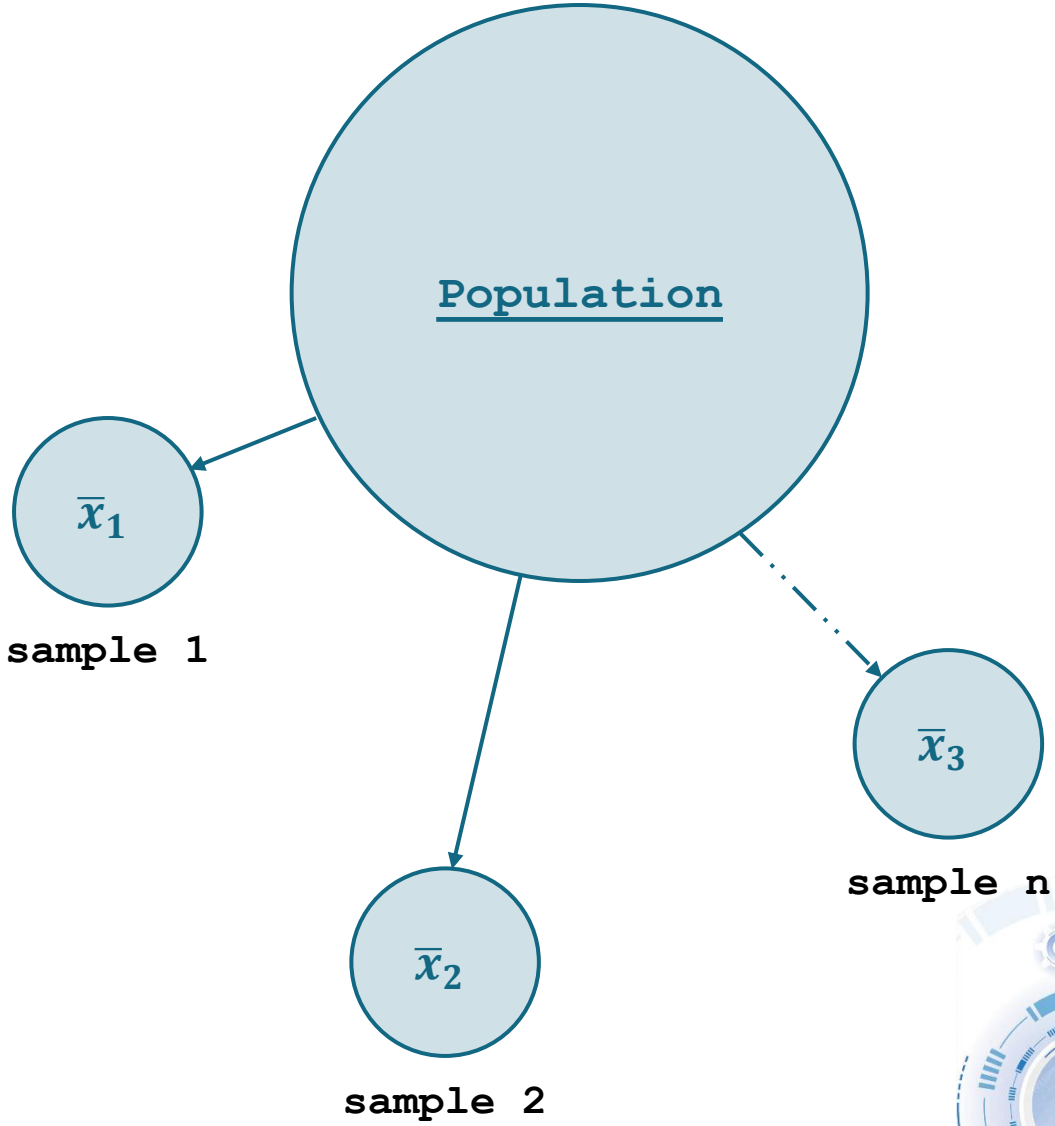
Dataset
1
2
2
3
3
3
4
4
5

Solution

CENTRAL LIMIT THEOREM

CENTRAL LIMIT THEOREM

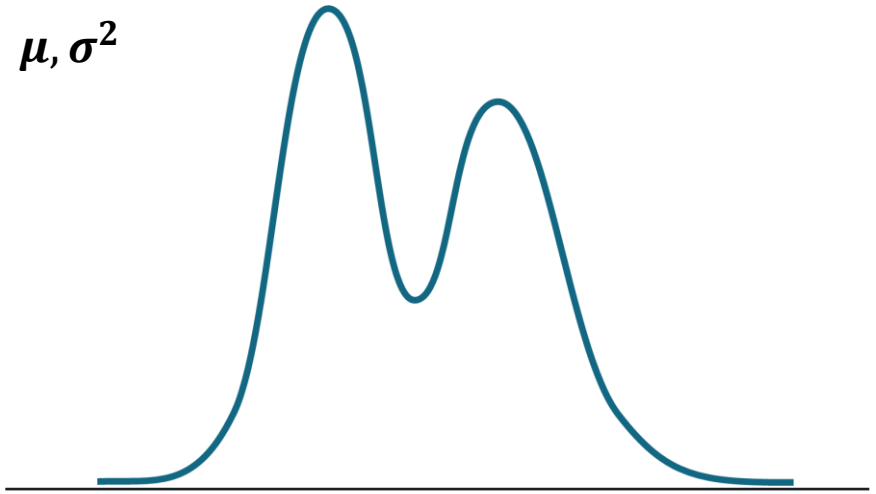
The **Central Limit Theorem** (CLT) states that the sampling distribution of the **sample mean** will be normally distributed, regardless of the shape of the original population distribution.



CENTRAL LIMIT THEOREM

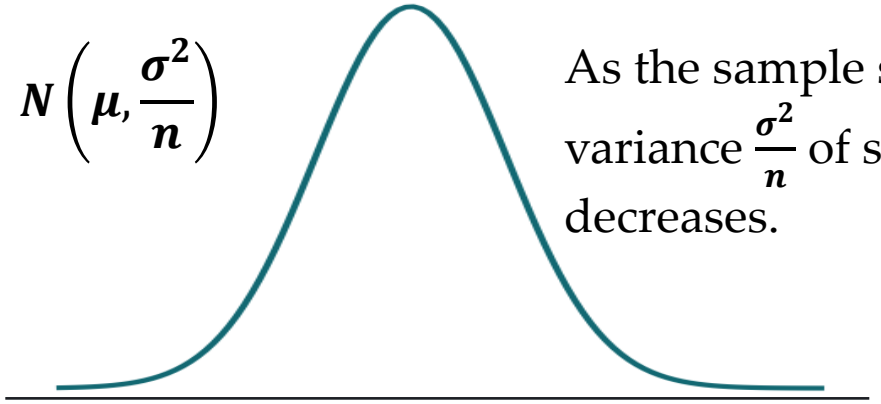
Original Population Distribution

μ, σ^2

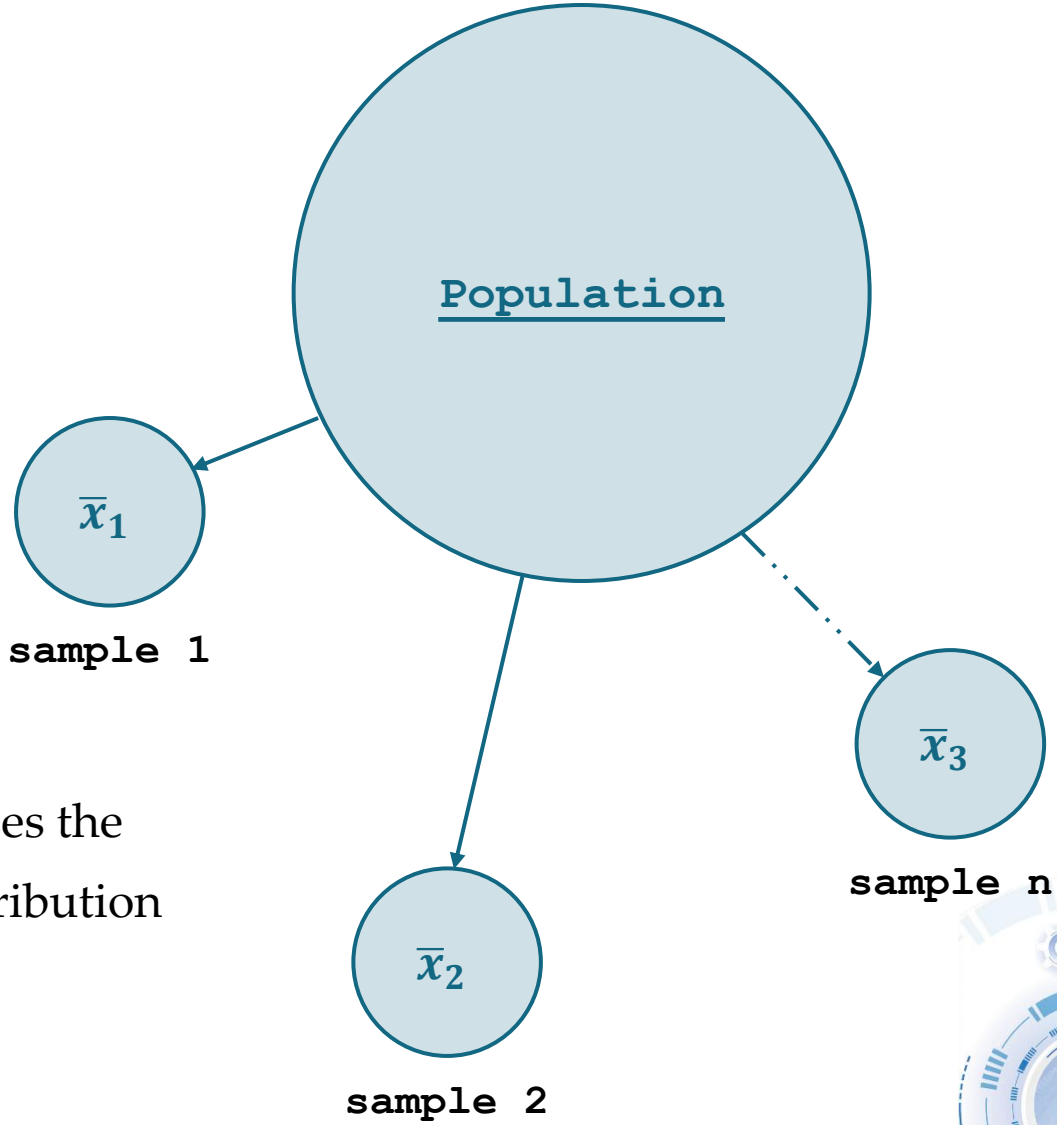


Sampling Distribution

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



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.

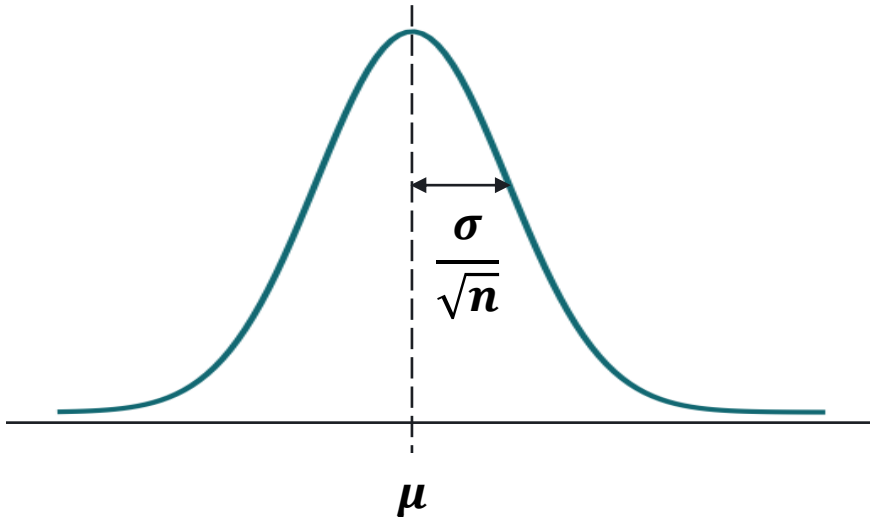
Denoted by

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

where:

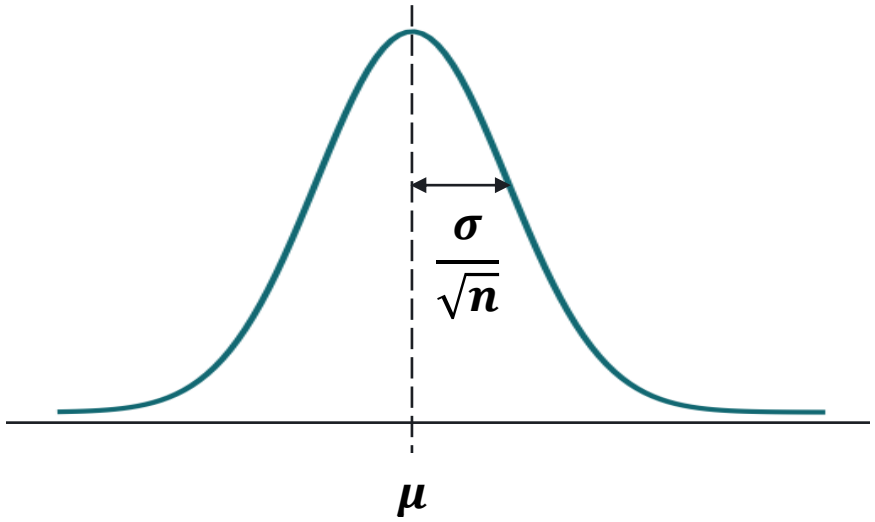
$\frac{\sigma^2}{n}$ is the variance of the sampling distribution

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