Course Reviews and Logistics

Decision Making Under Uncertainty (Transitional Year) - 2025/2026
ISCTE-IUL

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  - No. 2 - Photos of the board are not allowed without the express authorization of the instructor for that purpose.

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- Accordingly, statistical formalism is removed whenever possible to streamline students' first exposure.

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  - They are independent of each other: $f_{X_1,...,X_n}(x_1, ..., x_n) = \prod_{i=1}^{n} f_{X_i}(x_i)$

Statistics, Estimators and Estimates

- Both a statistic and an estimator are functions of the sample, $T_1 = T(X_1, ..., X_n)$. However, an estimator, $\hat{\theta} = f(X_1, ..., X_n)$, is a special case of a statistic because it allows us to obtain an estimate of an unknown but fixed parameter, θ, when a concrete sample is used, that is, when the realization of the random sample $(x_1, ..., x_n)$ is used. This process, called **inference**, yields a concrete value for the parameter $\theta^* = \hat{\theta}(x_1, ..., x_n)$.

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- ChatGPT does the same thing when someone enters a prompt, except its estimator is much, much, much, much more complicated!

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- Random Sample $(X_1, ..., X_n) \longrightarrow$ Estimator $(\hat{\theta}) \longrightarrow$ Estimate θ^*.
- This way of learning about a population or a phenomenon is used in various scientific fields... from economics to medicine.

Population vs Sample

- Following up on what was mentioned earlier... What is the difference between?
  - μ and $\bar{X} = \sum_{i=1}^{n} \frac{1}{n} X_i$ and σ^2 and $S^2 = \sum_{i=1}^{n} \frac{1}{n} (X_i - \bar{X})^2$

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  - $\underbrace{\mu}_{\text{Population Mean}}$ and $\underbrace{\bar{X} = \sum_{i=1}^{n} \frac{1}{n} X_i}_{\text{Sample Mean}}$ and $\underbrace{\sigma^2}_{\text{Population Variance}}$ and $\underbrace{S^2 = \sum_{i=1}^{n} \frac{1}{n}(X_i - \bar{X})^2}_{\text{Sample Variance}}$.

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- So what exactly is the difference between S^2 and $(S')^2$?
- Under what circumstance is using S^2 as an estimator the same as using $(S')^2$?