ALGES
ADVANCED LABORATORY FOR GEOSTATISTICAL SUPERCOMPUTING

Lab1: Fundamentals

Statistical and Geostatistical Data Analysis

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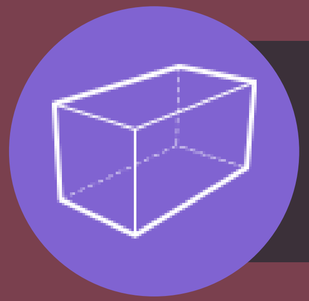

Introduction

Tools and communication

Graduate and postgraduate course

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Laboratory organization

- Laboratory/*Auxiliar* classes are practical
- We Will use Excel and ANDES software
- Communications Will be by email, u-cursos or ***Microsoft Teams*** (access provided by uchile email). My mail is ***fachotto*** at uchile.cl
- There is a Google calendar with a brief description of every class (subscription by mail)
- Videos will be available in Google Drive

Laboratory organization

- I Will help you during all the semester to develop the projects
- Classes are written in English and spoken in Spanish
- Solutions will be written in English (postgraduate) and Spanish (graduate)

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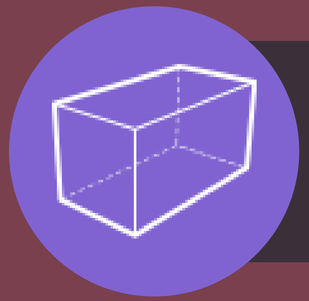

Fundamentals

Summary

Concept summary

- **Inferential statistics:** is the process to obtain generalizations on the total (called the population) by examining only a part (called the sample).

- **Random variable:** This is a function, denoted by X, that takes values over a sample space Ω associated with a random experiment.

- **Examples:**

1. Heads or tails
2. Dice throwing
3. Lotto
4. Element grade

Concept summary

- Expectation

$$\mu = E(X) = \int xp(x)dx \qquad \mu = E(X) = \sum_{n \in N} np(n)$$

- Variance

$$\sigma^2 = var(X) = E\{(X - \mu)^2\} = E(X^2) - \mu$$

- Standard deviation

$$\sqrt{\sigma^2}$$

Concept summary

- Experimental Mean

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

- Experimental Variance

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

Properties

$$E(\bar{X}) = \mu$$

$$var(\bar{X}) = \frac{\sigma^2}{n}$$

$$E(S^2) = \sigma^2$$

- Parameters of the population and sample are different

Population	Sample
$\boldsymbol{\mu}$	$\boldsymbol{m}$
$\boldsymbol{\sigma^2}$	$\boldsymbol{s^2}$

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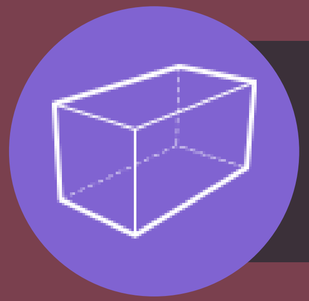

Problems

Problem 1:

- The copper grade has been measured on 20 samples taken in a stock pile.
- It is of interest to know how many samples are necessary in order to estimate the average copper grade of the stock pile with a typical error less than 0.01%Cu.
- File: *"Leyes de stock"*

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Problem 1:

- The copper grade has been measured on 20 samples taken in a stock pile.
- It is of interest to know how many samples are necessary in order to estimate the average copper grade of the stock pile with a typical error less than 0.01%Cu.
- Typical error is the square of: the variance divided by the number of data: $\sqrt{\frac{\sigma^2}{n}}$
- File: *"Leyes de stock"*

Problem 2:

- Let X be a Normal random variable $N(m,s)$ and $Y=e^X$ a lognormal random variable.
- Calculate the expectation and median of Y.
- (*) Determine the expectation of geometric mean of a sample of Y of size n.

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