Introduction to Statistical Methods, 2021-22

Probabilities & Statistics, Master in Computer Science, Télécom SudParis, Institut Polytechnique de Paris

General Course Information

INSTRUCTOR	Theophanis Tsandilas (theophanis.tsandilas at inria.fr)
LECTURES	Wednesdays 9:45 am - 12:25 pm
WEB SITE	https://www.lri.fr/~fanis/courses/Stats2021

Overview

The course is the second part of the module *Probabilities and Statistics* of the international Computer-Sciences Master program at Télécom SudParis (Institut Polytechnique de Paris). The course mainly targets students and researchers who are interested in experimental research methods and often have to deal with relatively small samples and messy data. Previous knowledge of statistics or probability theory is not required, but some understanding of basic notions of probabilities might help.

The course will introduce fundamental concepts of descriptive and inferential statistics. The goal of the course is NOT to provide a set of statistical recipes or step-by-step instructions. Particular focus will be given on understanding key principles, thinking about the underlying model assumptions, and recognizing the limitations of each statistical method.

The students will learn how to use the R software to analyze real datasets and how to apply computational methods to estimate parameters and evaluate statistical procedures.

Lectures will take place at Télécom Paris in Palaiseau in room 0D19 (or room 4A312 in December 1).

Assessment

Course Component	**Weight**
Assignment	50%
Exam	50%
Total	100%

Course Material

Part of the course content has been based on Thom Baguley's book:

> *Serious Stats: A Guide to Advanced Statistics for the Behavioral Sciences,* Palgrave Mcmillan, 2012.

However, no textbook will be required. Course material is based on proposed readings and other material presented in the class or posted online.

Course Coordination and Communication

During the term, we will use the Slack software (slack.com) to facilitate the communication between the instructor and the students

Slack workspace: stats-2021.slack.com

Course Calendar

The following is a tentative schedule. Topics may change during the term. Please, check the course's website for updates.

	Date (room)	**Description**
1	Nov 24 (0D19)	Basic concepts: data, populations, and samples. Why learning statistics? Types of data and descriptive statistics. Starting with R.
2	Dec 1 (4A312)	Discrete and continuous probability distributions: binomial, normal, and log-normal distributions. The sampling distribution of a statistic. The Central Limit Theorem.
3	Dec 8 (0D19)	Confidence intervals. Monte Carlo simulations. Experimental designs: independent groups, repeated measures.
4	Dec 15 (0D19)	Confidence intervals of non-normal distributions. Introduction to Null Hypothesis Significance Testing. Significance tests and p values. **Assignment handout.**
5	Jan 5 (0D19)	Significance tests: Type I and Type II errors. Statistical Power. The problem of multiple comparisons. Publication bias. p-hacking and criticisms of the NHST.
6	Jan 12 (0D19)	Covariance and correlation. Simple linear regression.
7	Jan 19 (0D19)	Final exam