Probability and Statistics

ECTS : 4

Volume horaire : 36

Description du contenu de l'enseignement :

This unit aims to give the students an overview of basic probabilities concepts as well as a descriptive statistical toolbox to summarise, organise and present data in a meaningful way.

This course aims to provide students with a first toolbox of basic data analysis techniques. When provided with a set of data in any other field in their curriculum, they should then be able to conduct a simple analysis and summarise the information contained in those data. The course also aims to educate students on the complexity of statistics and figures so that they keep a critical look when reading statistics and studies both in their academic and everyday life. Finally, it is a foundation for the year 2 Statistics course that will introduce more advanced statistical theory and techniques.

Compétence à acquérir :

By the end of this module, students will have demonstrated:
Knowledge

1. Knowledge and understanding of combinatorics
2. Basic knowledge of the mathematical definitions of the underlying concepts (sample space, probability measure, discrete/continuous distribution, joint/marginal distributions, random variable, PDF, CDF, Moments)
3. Knowledge of the in-scope common distributions. (Uniform, Bernoulli, Binomial, Poisson, Exponential, Normal)
4. Understanding of Bayes formula and total probabilities formula.

Skills

1. Appropriate use of counting techniques
2. Ability to derive moments of a random variable given its distribution.
3. Ability to identify the right distribution suited to real-life situations.
4. Ability to derive PDF and/or CDF from one another.
5. Accurate reading of statistics tables
6. Proficiency in the calculation and use of statistical indicators (mean, variance, Range, IQ, Gini)
7. Familiarity with graphic tools (Lorenz Curve, Box-plot, QQ-plot)

Values and Attitudes

1. Rigor in reasoning
2. Ability to articulate simple demonstrations

Mode de contrôle des connaissances :

The summative assessment is made of 2 mid-terms and a final exam:

- Test 1 (1.5h): exam on Probabilities
- Test 2 (1.5h): exam on Descriptive statistics

The Final exam (2h) will take place during exam week and will cover the whole course.

Each mid-terms is worth 25% of the Final grade and the Final exam is worth 50% of the Final grade.

Bibliographie, lectures recommandées :

Core Sources

Handout designed by Katia Meziani, head of course in Paris. Past papers and lectures slides will be available.

Supplementary and Secondary Sources

Probability and Statistics (4th edition) – Schaum's Outlines

Naked Statistics – Charles Wheelan

Statistics for Business and Economics, Anderson, Sweeney, Williams (11 ed).