

Complements of probabilities

Introducing

Description

Program (detailed contents):

- Sigma-algebra, sigma-algebra generated by one or many random variables.
- Conditional expectation with respect to a sigma-algebra generated by a partition and then with respect to a general sigma-algebra. Main properties of conditional expectation.
- Gaussian random vectors. Main properties, Gaussian miracle for the independence of coordinates, projection theorem for Gaussian random vectors, multidimensional central limit theorem.
- Classical inequalities arising in probability theory: Markov, Chebyshev, Cauchy-Schwarz and Hölder.
- Modes of convergence of random variables: almost sure, in probability, in distribution, in the L_p spaces, and links between them.

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- The notion of sigma-algebra generated by one or many random variables.
- The definition and main properties of a conditional expectation.
- The definition and main properties of a Gaussian vector.
- The various modes of convergence in probability theory and the links between them.

The student will be able to:

- Compute a conditional expectation with respect to a given sigma-algebra.
- Prove that a random vector is a Gaussian random vector and give the underlying parameters (expectation and covariance matrix); use the specific properties of Gaussian random vectors.
- Use classical inequalities appearing in probability theory.
- Prove that a given sequence of random variables converges (or not) almost surely, in probability, in distribution or in Lebesgue spaces (L_p spaces).

Necessary prerequisites

Course on Probability and Statistics (2MIC Semester 4).

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse