

- Faculté des sciences économiques
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Inferential Statistics and Test Theory

Characteristics

- 6 ECTS credits
- Compulsory course for master in statistics
- Autumn Semester
- Course : 2 hours / Exercises : 2 hours
- Evaluation : written exam 2 hours
- Prerequisite : Probability Theory

Teaching Team

- *Prof. Jean-Yves Dauxois*
Département Mathématiques,
Université de Franche-Comté,
16, route de Gray, 25030 Besançon Cedex, FRANCE
☎ +33 3 81 66 63 25- ✉ jean-yves.dauxois@univ-fcomte.fr
- *Anthea Monod*, assistante doctorante
Institut de Statistique
Pierre-à-Mazel 7, CH-2000 NEUCHATEL
☎ + 41 32 718 13 15- ✉ anthea.monod@unine.ch

Objectives

Introducing the theoretical background of Mathematical Statistics. Learning how to build, judge the performance, improve and compare the statistical procedures of point estimation, interval estimation and hypotheses testing.

Contents

- Statistical model
 - Definition, parametric and nonparametric models
 - Sampling models
 - Exponential families
 - Location-scale families
- Point estimation
 - Statistics and estimators
 - Classical methods of obtaining estimators: empirical estimation, method of moments, maximum likelihood method
 - Criteria to judge the performance of estimators: consistency, bias, risk, Fisher information, Cramer-Rao inequality
 - Improving estimators: sufficient statistic, Rao-Blackwell and Lehmann-Scheffé theorems
 - Asymptotic behaviour: Asymptotic normality, δ -method, the particular cases of the empirical estimators, the maximum likelihood estimators and method of moments estimators
- Interval estimation
 - Exact confidence intervals
 - Asymptotic confidence intervals
- Testing statistical hypothesis

- Introduction and definition : hypothesis, test statistics and critical regions, type I and type II errors, level of significance, power, p -value, bias, UMP tests, asymptotics tests
- Parametric tests: Neyman-Pearson Lemma, nonrandomized and randomized tests
- The particular case of gaussian samples: Hypothesis about the mean, hypothesis about the variance
- Nonparamétrics tests: Kolmogorov test, Khi2 tests, Kolmogorov-Smirnov test, Mann-Whitney test

Exercices

Textbooks

- J. Shao, *Mathematical Statistics*, 2^{nde} edition, Springer, 2003
- R. Bartoszynski and M. Niewiadomska-Bugaj, *Probability and Statistical Inference*, Wiley series in Probability and Statistics, 1996.