Université de Neuchâtel

COURSE DESCRIPTION 2007-2008

- Faculté des sciences économiques
- www.unine.ch/seco

Inferential Statistics and Test Theory

Characteristics

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

Teaching Team

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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: consistancy, 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
  - Exacts 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*, 2nde edition, Springer, 2003
- R. Bartoszynski and M. Niewiadomska-Bugaj, *Probability and Statistical Inference*, Wiley series in Probability and Statistics, 1996.