UCL Institut de statistique

STAT

STAT2413	Non parametric statistics

[22.5h+7.5h exercises] 5 credits

This course is taught in the 1st semester

Teacher(s):	Isabelle De Macq
Language:	french
Level:	2nd cycle course

Aims

The students will obtain knowledge about the basic concepts of nonparametric statistical inference. They will learn about elementary nonparametric testing procedures. They will be able to use these nonparametric procedures for analyzing real data, and this by using, for example, statistical software packages.

Main themes

The topics treated during this course are :
- The location problem: one sample
- Nonparametric estimation of a distribution function and a density function (via kernel method)
- Two independent samples: location and dispersion problems
- Goodness-of-fit tests
- Analysis of association (association measures)
- Order statistics and linear rank statistics
- Nonparametric inference for partially observed (censored) data

Content and teaching methods

Content
- Hypothesis tests concerning location and dispersion of a population, given an i.i.d. sample
- Detection of differences in location and/or dispersion between two populations
- Goodness-of-fit tests for checking whether an unknown distribution belongs to a given parametric family of distributions, or equals a specific parametric distribution
- Measures of association between two (or more) random variables
- The use of order statistics and rank statistics in nonparametric estimation and testing procedures
- Nonparametric estimation of a distribution function, a probability density and quantile functions
- Nonparametric estimation based on partial observations
Teaching methods
During the lectures we will explain for each of the statistical procedures the following :
the motivation behind a test statistic, how to obtain the distribution of the test statistic under the null hypothesis, and how to construct the testing procedure.
The aim is to get insight into nonparametric testing procedures and to learn about the different aspects of such procedures.
At the end of the course the students have to work through some course work (a project) that will allow them to get more familiar with the use of nonparametric methods in practical applications, when for example analyzing real data.

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Prerequisites
Basic knowledge about probability and statistics: descriptive statistics, calculating probabilities, distributions, distribution function, probability density, means, variances (conditionally or not), linear regression, principles of parametric hypothesis testing
Evaluation
The evaluation consists of two parts: a project-work and an oral exam. The project concerns, among others, the use of nonparametric methods discussed in the course when analyzing real data, and the use of statistical software for getting answers to questions. A written report on the accomplished project and analysis of real data has to be provided. The oral exam consists also of two parts: questions about the project (defense of the project) and questions on the topics treated during the course
Teaching materials
There are course notes, as well as statistical tables for most nonparametric tests. Some material on statistical software packages for this course is also available.
Teachers
Professor: I. Gijbels, Tel: 010/474306
Teaching Assistant: A. Delaigle, Tel: 010/478828
References
Gibbons, J.D. (1971). Nonparametric Statistical Inference. McGraw-Hill, New York.
Hollander, M. et Wolfe, D.A. (1999). Nonparametric Statistical Methods. Second Edition. Wiley, New York.
Lehmann, E.L. (1998). Nonparametrics: Statistical Methods Based on Ranks. Revised First Edition. Prentice Hall, New Jersey.
Maritz. J.S. (1995). Distribution-free Statistical Methods. Second Edition. Chapman and Hall, New York.
Mouchart, M. et Simar, L. (1978). Méthodes nonparamétriques. Recyclage en statistique, volume 2. Université catholique de Louvain, Louvain-la-Neuve, Belgique.
Randles, R. and Wolfe, D. (1979). Introduction to the Theory of Nonparametric Statistics. Wiley, New York.
For more information:
http://www.stat.ucl.ac.be/cours/stat2413/index.html http://www.stat.ucl.ac.be/cours/stat2413/index.html

Other credits in programs

ECGE3DS/MK	Diplôme d'études spécialisées en économie et gestion (Master in business administration) (marketing)	(5 credits)	
MATH22/S	Deuxième licence en sciences mathématiques (Statistique)	(3.5 credits)	Mandatory
STAT2MS	Master en statistique, orientation générale, à finalité spécialisée	(5 credits)	
STAT3DA	Diplôme d'études approfondies en statistique		
STAT3DA/B	diplôme d'études approfondies en statistique (biostatistique et épidémiologie)	(5 credits)	
STAT3DA/M	Diplôme d'études approfondies en statistique (méthodologie de la statistique)	(5 credits)	
STAT3DA/P	diplôme d'études approfondies en statistique (pratique de la statistique)	(5 credits)	