

## Multivariate Analysis

### Objectives

This course is designed to broaden the student's understanding of the statistical processing of multivariate data. It should enable him or her to master both the theoretical background and the context of applications of multivariate analysis. At the end, the student should be able to apply the multivariate techniques presented in this course to his or her own research studies and to carry out real life applications with a critical appraisal of the results and conclusions. The main domains leading to multivariate data sets are socio-economic surveys, biometrics, behavioural sciences, geographic data bases, demography, marketing research ...

### Contents

1. Brief review of basics of statistics and matrix algebra.
2. Exploratory Multivariate Analysis: Principal axes techniques (singular value decomposition, principal component analysis, canonical analysis, simple and multiple correspondence analysis, discriminant analysis).
3. Exploratory Multivariate Analysis: Clustering techniques (hierarchical clustering, k-means and related methods, self organizing maps).
4. Links between these exploratory tools and some classical model based methods such as generalised linear models, discriminant analysis, and regression trees.
5. Assessment methods that involve resampling schemes such as the *bootstrap* methods.

Eventually, since hand calculations are virtually impossible in this field, illustrations will be performed with the aid of the software R.

### Evaluation

According curriculum 2010-2011 :

- E : 2-hour written test during the end-of-semester examination session.
- *Reexamination session (September) : 2h written test*

### Textbooks

- L. Lebart, A. Morineau, K. Warwick (1984) *Multivariate Descriptive Statistical Analysis*, Wiley (Wiley Series in Probability and Mathematical Statistics), New York
- L. Lebart, M. Piron, A. Morineau (2006) *Statistique Exploratoire Multidimensionnelle*, Dunod, 4<sup>ème</sup> édition, 480p (*in French*)
- K. V. Mardia, J. T. Kent, J. M. Bibby (1980) *Multivariate Analysis* London; Academic Press (Probability and mathematical statistics), New York.

### Characteristics

- 3 ECTS credits
- Compulsory course for master in statistics
- Autumn Semester
- Course : 2 hours
- Prerequisite : [basics in statistics and linear algebra](#)

### Teaching team

- *Antoine de Falguerolles*  
☎ phone office +33 5 61 12 38 20 : - ✉ email : [falguero@cict.fr](mailto:falguero@cict.fr)