

## Computational Statistics

### Objectives

Master the theoretical and practical aspects of the computer based methods in statistics. At the end, the student should be able to apply the methods presented in this course to his or her own research studies.

### Contents

The course introduces a number of methods that make use of computer resources to do statistical analysis and modeling. Some of these methods use resampling and repeated simulations to calculate standard errors, confidence intervals, significance tests, etc. The course emphasizes the practical side of the methods, by illustrating the theoretical issues with practical applications using the R software.

- Random variable generation
- Elements of Monte Carlo statistical methods
- Elements of MCMC computation, Metropolis-Hastings algorithm, EM algorithm
- Resampling methods for estimating and testing (jackknife, bootstrap, resampling methods for model assesment and selection).

### Evaluation

According curriculum 2010-2011 :

- CC : Continuous assessment - two practical assesment within-semester and an end-of-semester practical examination (2 hours).
- *Reexamination session (September)* : practical exam (2 hours).

### Textbooks

- G. H. Givens, J. A. Hoeting (2007), *Computational Statistics*, Wiley.
- J.E. Gentle (2000), *Random number generation and Monte Carlo methods*, Springer.
- B. Efron, R. Tibshirani (1993), *An Introduction to the bootstrap*, Chapman and Hall.
- A.C. Davison, D.V. Hinkley (1997), *Bootstrap Methods and their Applications*, Cambridge University Press.
- C.P. Robert, G. Casella (2004), *Monte Carlo statistical methods*, Springer.

### Characteristics

- 6 ECTS credits
- Compulsory course for master in statistics
- Spring Semester
- Course+exercises: 4 hours
- Prerequisite: basic notions of probability and statistics, knowledge of the R software.

### Teaching team

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