UCL Université catholique de Louvain

LSTAT2180

2015-2016

Resampling methods with applications

4.0 credits	15.0 h + 5.0 h	1q

Teacher(s) :	El Ghouch Anouar ; Van Keilegom Ingrid ; El Ghouch Anouar (compensates Van Keilegom Ingrid) ;
Language :	Français
Place of the course	Louvain-la-Neuve
Prerequisites :	*The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.*
Main themes :	After having completed this course, a student should be able : > to use correctly the resampling methods ; > to understand the underlying mechanisms justifying their use ; > to use the techniques to solve problems with real data, and to draw appropriate conclusions.
Aims :	*The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Content :	The course presents the basic techniques of resampling methods (bootstrap, jacknife,. . .) useful in statistics. Those methods are now getting more and more popular and present reliable alternatives to traditional asymptotic methods, mostly based on applications of the Central Limit Theorem. The bootstrap offers an attractive alternative in many applications when determining the sampling distribution of a statistics of interest (estimator, test statistics, . . .). In many situations, the quality of the approximation is better than its asymptotic counterpart, while in some others, the asymptotic approximation is not available and the bootstrap turns out to be the only possibility for statistical inference. The resampling methods are first introduced in a general framework and their theoretical properties are investigated. Then, keeping in mind that they are first and foremost practical procedures, they are illustrated through many standard problems of statistical inference and concrete statistics and econometrics questions, in order to emphasise the broad range of applications that they apply to.

Other infos :	Prerequisites: A good knowledge of basic statistical inference is preferable. Contents: > Basic ideas of the bootstrap > Monte-Carlo methods > Application to basic statistical problems : bias of an estimator, confidence intervals, . . . > Theoretical properties of the bootstrap > Hypothesis testing through resampling > Bootstrap in regression models > Iterated bootstrap > The Jacknife > The smoothed bootstrap > Bootstrap in time series Support: - Handout : > Simar, L. (2008), "An Invitation to the Bootstrap : Panacea for Statistical Inference ?", Institut de Statistique, UCL. Available on-line. Other references include : > Chernick, M.R. (2008), "Bootstrap methods : a guide for practitioners and researchers", Wiley Series in Probability and Statistics. > Davison, A.C. and Hinkley, D.V. (1997), "Bootstrap Methods and their Applications", Cambridge University Press. > Efron, B. and Tibshirani, R.J. (1993), "An Introduction to the Bootstrap", Chapman and Hall. > Hall, P. (1992), "The Bootstrap and Edgeworth Expansion", Springer. Evaluation The students are asked to prepare a report on a personal project. This project comprises two parts : 1. Analysing in a given statistical model the properties of bootstrap estimators of a given characteristic. Simple and direct application of the methods presented in the course, worth 1/3 of the points. 2. Analysing in an original and open theme the properties of bootstrap estimators of some given characteristics of interest, and draw interesting conclusions. Original and inventive exercise, worth 2/3 of the points. A list of prospective projects, with guidelines, will be provided at the first class. The report should be ±15 pages, and should be handed in by a certain date, fixed by the professor at the first class.
Faculty or entity in charge:	LSBA

Programmes / formations proposant cette unité d'enseignement (UE)				
Intitulé du programme	Sigle	Credits	Prerequis	Acquis d'apprentissage
	STAT9CE	4	-	
Master [120] in Statistics: Biostatistics	BSTA2M	4	-	
Master [120] in Statistics: General	STAT2M	4	LSTAT2020 **and** LSTAT2040	
	STAT2FC	4	-	