UCLouvain

lstat2440

2022

Inference and Data Reduction

4.00 credits	15.0 h + 7.5 h	Q1

Teacher(s)	von Sachs Rainer ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	Concepts and tools equivalent to those taught in teaching units LSTAT2190 Concepts et traitement de vecteurs aléatoires LSTAT2040 Inférence statistique et vraisemblance
Main themes	The course is a follow-up to the course LSTAT2040. Concepts in statistical methodology, in particular for optimal inference, will be treated in greater depth and will be complemented by a non-asymptotic theory.
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 By the end of the course, the student will have become familiar with the necessary concepts in mathematical statistics complementary to (asymptotic) likelihood theory. The concept of sufficiency has become also important recently for dimension reduction in high-dimensional statistics. The student will be able to put the different themes in a general, abstract context, both regarding their application to problems in statistical analysis and regarding their interpretation. The student will master the technical tools to apply the concepts correctly and will be able to reproduce and to elaborate upon the mathematical arguments underlying the results. The concept of sufficiency has become also important recently for dimension reduction in high-dimensional statistics.
Evaluation methods	There will be an oral exam, preceded by a written preparation. Alternatively, the student will be evaluated on his presentation during the course.
Teaching methods	The course consists of both lectures and tutorials. The lecture part of the course will often be taught by the concept of "classe inversée", i.e. students read the course material (detailed syllabus) in advance, meet the teacher to prepare a presentation and present the material in front of their peers.
Content	**Theory of Optimality for Statistical Inference** The concept of sufficiency, in particular when applied to the important and rich class of exponential families, delivers a non-asymptotic theory of optimality of statistical procedures. The applications are numerous: for risk-optimal point estimation one can define the concept of UMV(U) estimators, i.e. "uniformly minimal variance (unbiased)" estimators. For the theory of statistical hypothesis testing, to be more abstractly formalised following the Neyman principle, it is possible to characterise the optimality of existing tests via the concept of UMP(U) tests, i.e., "uniformly most powerful (unbiased)" tests. A particular challenge here is the treatment of multi parameter families. Finally, the results from test theory can be directly transferred to define optimality of confidence regions.
Inline resources	https://moodle.uclouvain.be/course/view.php?id=4279
Bibliography	A part du syllabus du cours, les ouvrages suivants sont à conseiller: - Casella, G., Berger, R.L. (2001). Statistical Inference (2nd ed). Cengage Learning. - Lehmann, E.L. (1999). Elements of Large-Sample Theory. Springer. - Lehmann, E.L., Romano, J. (2005). Testing Statistical Hypotheses (3rd ed). Springer. - Monfort, A. (1997). Cours de statistique mathématique (3rd ed). Economica.
Other infos	The course notes will be distributed during the lectures itself. There will also be a Syllabus.
Faculty or entity in charge	LSBA

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Mathematics	MATH2M	5		🔍
Master [120] in Statistics: General	STAT2M	4		🔍
Certificat d'université : Statistique et science des données (15/30 crédits)	STAT2FC	4		🔍