UCLouvain

lstat2150

2026

Smoothing techniques

5.00 credits	22.5 h + 9.5 h	Q1

Teacher(s)	Kiriliouk Anna ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	Concepts and tools equivalent to those taught in the teaching units : • LSTAT2120 Linear models • LDATS2030 Programming and data reporting in R
Main themes	This is the second general training course in nonparametric statistics, focusing on smoothing methods: nonparametric estimation of a density function and a regression function (using the kernel method, local polynomial estimation and splines) and generalised additive models.
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 Second course of general education in nonparametric statistics, which mainly focuses on smoothing methods.
Evaluation methods	The exam consists of two parts: • A compulsory project (in R) is to be submitted at the end of the semester and will count for 50% of the final grade. • An oral exam covering all course material (50% of the final grade). Questions about the assignment will also be part of the exam. Following Article 72 of the General Regulations for Studies and Examinations, the course instructor may propose to the jury that a student who has not submitted the assignment in time is to be prohibited from registering for the exam.
Teaching methods	The course material is taught during classroom lectures completed by two R tutorials.
Content	Introduction to nonparametric statistics, focusing mainly on non-parametric smoothing methods: density estimation (kernel method); nonparametric regression (kernel method, nearest neighbours, local polynomials); spline-based smoothing; Generalized Additive Models; theoretical aspects (comparison of different estimation methods using bias, variance, MSE). These topics are mainly covered from a methodological point of view, with illustrations on real data using the statistical programming language R.
Inline resources	https://moodle.uclouvain.be/course/view.php?id=2395
Bibliography	Fan, J. et Gijbels, I. (1996). Local polynomial modelling and its applications. Chapman & Hall. Green, P.J. et Silverman, B.W. (2000). Nonparametric regression and generalized linear models. Chapman & Hall. Härdle, W. (1990): Applied Nonparametric Regression. Cambridge University Press. Simonoff, J.S. (1996). Smoothing methods in Statistics. Springer. García-Portugués, E. (2025). Notes for Nonparametric Statistics. Version 6.12.1. Available at https://bookdown.org/egarpor/NP-UC3M/. Hastie, T., Tibshirani, R., & Friedman, J. (2009). The Elements of Statistical Learning. Springer. Hastie, T. & Tibshirani, R., (1990). Generalized Additive Models. Chapman and Hall. Wood, S.N. (2017). Generalized Additive Models: an Introduction with R. CRC Press.
Other infos	Prerequisites. Basic knowledge about probability and statistics: descriptive statistics, calculating probabilities, cumulative distribution function, probability density function, means, variances, linear regression.
Faculty or entity in charge	LSBA

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Data Science : Statistic	DATS2M	5		
Master [120] in Statistics: Biostatistics	BSTA2M	5		
Master [120] in Mathematics	MATH2M	5		
Master [120] in Statistics: General	STAT2M	5		
Master [120] in Mathematical Engineering	MAP2M	4		
Master [120] in Economics: General	ECON2M	5		
Master [120] in Data Science Engineering	DATE2M	4		
Certificat d'université : Statistique et science des données (15/30 crédits)	STAT2FC	5		
Master [120] in Data Science: Information Technology	DATI2M	4		