UCLouvain

lstat2430

2021

Nonparametric curve estimation : Fourier-based methods

5 crédits	30.0 h	Q2

Cette unité d'enseignement bisannuelle est dispensée en 2021-2022

Enseignants	von Sachs Rainer ;
Langue d'enseignement	Anglais
Lieu du cours	Louvain-la-Neuve
Thèmes abordés	The objective of this lecture is to develop applications of non-parametric curve estimation methods to two modern fields of statistics: for the one, to the estimation of spectral densities of time series, including multivariate time series, for the other the interpretation of projection-based estimators as (linear and non-linear) smoothers in a general regression or density estimation context.
Acquis d'apprentissage	1 A. Eu égard au référentiel AA du programme de master en statistique, orientation générale, cette activité contribue au développement et à l'acquisition des AA suivants, de manière prioritaire : 2.4, 3.1, 3.3, 4.4, 6.1, 6.2 B. Students will be able to understand and appreciate finite sample and asymptotic properties of modern curve estimation methods, along the problem of estimating spectral densities of time series (an alternative and compact way to describe the correlation structure in a given time series in an enhanced and interpretable way). For projection based estimators (e.g. wavelet estimators), the emphasis will be on understanding the link to classical kernel estimation and why non-linear (threshold) based projection estimators can oer interesting advantages, both in theory and practice. Beyond developing the theoretical background, the numerical performance of the studied methods will be analysed by the students along a practical project (in R or matlab). Hence, having followed this course, the students will have seen all facets of the methodology on nonparametric curve estimation in two more advanced set-ups for which a deeper understanding of the concepts behind should enable them to correctly apply the shown methods and interpret their results in a concrete data situation. - - - - *La contribution de cette UE au développement et à la maîtrise des compétences et acquis du (des) programme(s) est accessible à la fin de cette fiche, dans la partie « Programmes/formations proposant cette unité d'enseignement (UE) ».*
Contenu	1. Spectral density estimation: Definition, periodogram-based kernel estimators(properties, asymptotics, higher order kernels, multivariate spectral densities, bandwidth selection, time-varying spectral densities), interpretations. 2. Projection-based estimators: General definition, specific wavelet approach (properties and asymptotics, mainly via simple Haar basis estimators), comparison of linear and non-linear methods (link to kernel estimation, overview on dierent thresholding methods), examples.
Bibliographie	• Brockwell, P. and Davis, R. (2009). Time Series: Theory and Methods. Springer Series in Statistics. • Shumway, R. and Stoffer, D. (2011). Time Series and its Applications. Springer. • Brillinger, D. (1981). Time Series; Data Analysis and Theory. Holden Day. • Vidakovic, B. (1999). Statistical Modellng by Wavelets. Wiley. • Härdle, W., Kerkyacharian, G., Picard, D., Tsybakov, A.B. (1998). Wavelets, Approximation and Statistical Applications. Springer Lecture Notes in Statistics. • Nason, G.P. (2008). Wavelet Methods in Statistics with R. Springer.
Faculté ou entité en charge:	LSBA

Programmes / formations proposant cette unité d'enseignement (UE)

Intitulé du programme	Sigle	Crédits	Prérequis	Acquis d'apprentissage
Master [120] en statistique, orientation générale	STAT2M	5		🔍
Certificat d'université : Statistique et sciences des données (15/30 crédits)	STAT2FC	5		🔍