STAT3130 Special topics in mathematical statistics

[15h] 3 credits

This course is taught in the 2nd semester

Teacher(s): Sébastien Van Bellegem, Rainer von Sachs
Language: English
Level: Third cycle

Aims

This course treats in a bi-yearly alternating fashion, some special topics in mathematical statistics which are not treated by other courses. It is focused around two complimentary parts: functional estimation, and spectral analysis.

Main themes

The "functional estimation" part of this course aims at introducing the students to the various aspects of local modelling in nonparametric and semi-parametric functional estimation. In this part you will learn about how to develop estimation (or testing) procedures via local modelling ideas, about theoretical aspects of these procedures (convergence, asymptotic laws, etc), and about their practical aspects (implementation,etc). Each year we will focus on two or three related subjects that deal with functional estimation using local modelling ideas.
The "spectral analysis" part of this course aims at giving students interested in qualitative signal processing an introduction into the theory and practice of Fourier and local Fourier (wavelet) analysis. You will learn how to nonparametrically model and analyse statistical signals (including time series) in the frequency and in the time-frequency domain.

Content and teaching methods

PART I : « Functional estimation » :
1. Introduction to local modelling
2. Multivariate (generalized) additive regression models (for example)
3. Modelling interactions (for example)
4. Single-index models (for example)
PART II : « Spectral analysis » :
1. Introduction to Fourier analysis
2. Spectral analysis of time series
3. Time-frequency methods (local Fourier, wavelets, etc.)
4. Spectral representations of stationary and non-stationary processe

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

References
Brockwell, P. and Davis, R. (1991): Time Series: Theory and Methods.Springer, New York.
Efromovich, S. (1999). Nonparametric curve estimation: methods, theory and applications.
Springer-Verlag, Berlin.
Fan, J. and Gijbels, I. (1996). Local Polynomial Modelling and Its Applications. Chapman and Hall, New York.
Hastie, T. and Tibshirani, R. (1990). Generalized Addtive Models. Chapman and Hall, London.
Mallat, S. (1999): A wavelet tour of signal processing. 2 ed. AP, London.
Schimek, M.G. (editor). (2000). Smoothing and Regression: Approaches, Computations
and Application. Wiley, New York.
Shumway, R., Stoffer, D. (2000): Time Series Analysis and Its Applications.
Springer, New York.

Programmes in which this activity is taught

MAPA3DA	Diplôme d'études approfondies en mathématique
STAT3DA	Diplôme d'études approfondies en statistique

Other credits in programs

STAT3DA	Diplôme d'études approfondies en statistique	
STAT3DA/E	diplôme d'études approfondies en statistique (statistique et économétrie)	(3 credits)
STAT3DA/M	Diplôme d'études approfondies en statistique (méthodologie de la statistique)	(3 credits)
STAT3DA/P	diplôme d'études approfondies en statistique (pratique de la statistique)	(3 credits)