High-Dimensional Statistics and Econometrics

Course title - Intitulé du cours	High-Dimensional Statistics and Econometrics
Level / Semester - Niveau /semestre	M2 / S2
School - Composante	Ecole d'Economie de Toulouse
Teacher - Enseignant responsable	Eric GAUTIER
Other teacher(s) - Autre(s) enseignant(s)	
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Other teacher(s) - Autre(s) enseignant(s)	
Lecture Hours - Volume Horaire CM	12 or 15h
TA Hours - Volume horaire TD	0
TP Hours - Volume horaire TP	0
Course Language - Langue du cours	Anglais
TA and/or TP Language - Langue des TD et/ou TP	Anglais

Teaching staff contacts - Coordonnées de l'équipe pédagogique :

Professor: Eric Gautier, office T532, eric.gautier@tse-fr.eu, available for questions in the classroom after class in the same room, else by appointment.

Course's Objectives - Objectifs du cours :

The following themes will be studied:

- High dimensional linear and nonparametric regression, Gaussian sequence space Model and examples of application
- Classical estimators (thresholding, BIC, Lasso, Ridge, Dantzig selector…)
- Basic notions of nonsmooth optimization and concentration
- Performance (fast and slow rates, model selection, performance without sparsity, adaptive nonparametric estimation, restricted eigenvalue)
- Consequences of the first order condition : uniqueness, algorithms and their acceleration, regularization paths
- Pratical and computational aspects
- Scaled-invariant methods
- Generalized linear models
- Applications in Econometrics
- Automatic bias correction and inference on combinations of coefficients
- Application to consumer demand or Matrix completion and panel data models

Prerequisites - Pré requis :

Linear and logistic regression, maximum-likelihood, basic Bayesian statistics, instrumental variables, optimization, and R programming.

Grading system - Modalités d'évaluation :

The final grade comes from one presentation (by group of 2) that counts for 2/3 and a final exam on the course material (25 minutes, no book, notes, telephone or tablet allowed) that counts for 1/3.

Toulouse School of Economics

Bibliography/references - Bibliographie/références :

Peter Bühlmann & Sara van de Geer, Statistics for High-Dimensional Data, Springer
Christophe Giraud, Introduction to High-Dimensional Statistics, Chapman &Hall
Trevor Hastie, Robert Tibshirani, & Martin Wainwright, Statistical Learning with Sparsity, Chapman &Hall.