MATH-408

Modern regression methods

Davison Anthony

Cursus	Sem.	Type
Financial engineering	MA2, MA4	Opt.
Ing.-math	MA2, MA4	Opt.
Mathématicien	MA2	Opt.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	Written
Workload	150h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Remark

Course given every two years

Summary

A second course on regression modelling, dealing with nonlinear effects of explanatory variables, and non-normal and dependent response variables.

Content

Revision of linear regession and likelihood inference

Fitting algorithms for nonlinear models and related diagnostics

Generalised linear model; exponential families; variance and link functions

Proportion and binary responses; logistic regession

Count data and Poisson responses; log-linear models

Overdispersion and quasilikelihood; estimating functions

Mixed models, random effects, generalised additive models and penalized regression

Keywords

Binary response; Count data; Deviance; EM algorithm; Estimating function; Iterative weighted least squares algorithm; Lasso; Likelihood; Logistic regression; Longitudinal data; Mixed model; Multinomial distribution; Overdispersion; Poisson distribution; Quasi-likelihood; Random effects

Learning Prerequisites

Required courses

Knowledge of basic probability and statistics, at, for example, the levels of MATH-240 and MATH-230

Linear models (MATH-341) or equivalent

Important concepts to start the course

Linear regression; likelihood inference; R

Learning Outcomes

By the end of the course, the student must be able to:

- Develop theoretical elements needed in regression analysis
- Apply the statistical package R to the analysis of data
- Assess / Evaluate the quality of a model fitted to regression data, and suggest improvements
- Choose a suitable regression model

Transversal skills

- Demonstrate a capacity for creativity.
- Demonstrate the capacity for critical thinking
- Write a scientific or technical report.

Teaching methods

Ex cathedra lectures; homework both theoretical and practical; mini-project

Expected student activities

Attending lectures; solving theoretical problems; solving applied problems using statistical software

Assessment methods

Written final exam; mini-project
Dans le cas de l'art. 3 al. 5 du Règlement de section, l'enseignant décide de la forme de l'examen qu'il communique aux étudiants concernés.

Supervision

Office hours	Yes
Assistants	Yes
Forum	Yes

Resources

Bibliography

Davison, A. C. (2003) Statistical Models. Cambridge University Press.

Ressources en bibliothèque

- Statistical Models / Davison