

Academic Year: (2023 / 2024)

Review date: 29-09-2023

Department assigned to the subject: Statistics Department

Coordinating teacher: NOVO DIAZ, SILVIA

Type: Electives ECTS Credits : 3.0

Year : 1 Semester : 2

OBJECTIVES

Become familiar with different analytical tools, based on data, to make business decisions

Develop skills to analyze and find relationships between many variables/features

Relax some of the assumptions in classical linear regression

Deal with the curse of dimensionality in high-dimensional problems

Acquire knowledge about the main tools in advanced predictive tools and handle the R language with those models

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction.
 - 1.1. Motivating examples.
 - 1.2. Linear regression: a brief review.
 - 1.3. Extensions of linear models.
2. Non-linear relationships.
 - 2.1. Introduction.
 - 2.2. Transformations.
 - 2.3. Interactions.
 - 2.4. Polynomial regression.
 - 2.5. Non-linear regression models.
3. Generalized regression models.
 - 3.1. Introduction.
 - 3.2. Model formulation and estimation.
 - 3.3. Inference for model parameters.
 - 3.4. Model selection.
 - 3.5. Model diagnostics.
 - 3.6. Extensions.
4. Regularization methods.
 - 4.1. Introduction.
 - 4.2. Ridge regression.
 - 4.3. LASSO regression.
 - 4.4. Elastic Net.
 - 4.5. Selection of tuning parameters.
5. Dimension reduction methods.
 - 5.1. Introduction.
 - 5.2. Principal component regression.
 - 5.3. Partial least squares.
6. Ensemble methods.
 - 6.1. Introduction.
 - 6.2. Boosting.
 - 6.3. Bagging.
 - 6.4. Stacking.

LEARNING ACTIVITIES AND METHODOLOGY

Lectures: the contents of the course will be introduced, explained and illustrated with examples. Teaching materials will be provided on Aula Global.

Computer Labs: Examples and cases studies with the R language.

ASSESSMENT SYSTEM

Continuous evaluation through two assignments (50%) and final exam (50%).

% end-of-term-examination:	50
% of continuous assessment (assignments, laboratory, practicals...):	50

BASIC BIBLIOGRAPHY

- G. James, D. Witten, T. Hastie and R. Tibshirani An Introduction to Statistical Learning with Applications in R, Springer, 2013
- Kevin P. Murphy Machine Learning: A Probabilistic Perspective, The MIT Press, 2012
- Machine Learning with R Brett Lantz, Packt Publishing, 2015