UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Statistical Learning

2425-1-F9102Q023

Aims

The course covers a set of tools for modelling and understanding complex datasets behind the Statistical Learning world. Statistical Learning has become a very hot field in many scientific areas as well as marketing, finance, and other business disciplines.
At the end of the course, students will be able to properly use Statistical Learning techniques to analyse their data.

Contents

The course deals with Statistical Learning techniques for handling specific data's issue such as local regression, tree-based methods, and support vector machine. Additionally, the course introduces to the students the R software.

Detailed program

1. Introduction to Statistical Learning
2. Statistical Learning in High Dimensions
3. Moving beyond linearity: regression and smoothing splines, local regression, generalized additive models and multivariate adaptive regression splines
4. Tree-based methods: decision trees, bagging, random forests, boosting, and Bayesian additive regression trees
5. Bootstrap confidence intervals
6. Multiple testing and the False Discovery Rate
7. Statistical learning with the software R

Prerequisites

Advanced Foundations of Statistics for AI and Advanced Foundations of Mathematics for AI

Teaching form

Lessons are held both in classroom and in lab, integrating theoretical principles with practicals of data analysis and programming in R.

Textbook and teaching resource

[ESL]
Hastie, T., Tibshirani, R., Friedman, J., The Elements of Statistical Learning, Springer (2008).
book available on-line at https://hastie.su.domains/Papers/ESLII.pdf

[CASI]
Efron, B., Hastie T., Computer age statistical inference, Cambridge university press (2016).
book available on-line at https://hastie.su.domains/CASI/

[ISL]
Gareth J., Witten D., Hastie T., Tibshirani R., An Introduction to statistical learning with application in R, Springer, second edition (2021).
book available on-line at https://www.statlearning.com/

[FES]
Kuhn, M., Kjell, J., Feature Engineering and Selection. Chapman and Hall/CRC (2019)
online version of the book at http://www.feat.engineering/.
If necessary, research documents/papers will be also provided during the course.

Semester

Second

Assessment method

Written exam that aims at verifying both theoretical and practical acquired knowledge. The oral exam is optional; if requested (by the student or by the teacher), the final mark is obtained by averaging written and oral marks.

Office hours

Students that would like to fix an appointment with the Professor should send an email to matteo.borrotti@unimib. The appointment can be arranged both in presence or on-line.

Sustainable Development Goals

QUALITY EDUCATION