



UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Statistical Learning M

2122-2-F8204B015

Learning objectives

Statistical learning _____ The course aims to introduce the main methods of Statistical Learning, discussing both the algorithms and the inferential aspects.

Contents

- high-dimensional regression
- variable selection with statistical guarantees
- conformal prediction

Detailed program

- Prediction, Estimation, and Attribution.
- James-Stein estimation.

- Ridge regression.
- Splines.
- Additive models.
- Classical versus high-dimensional theory.
- Sparse Modeling and the Lasso.
- Best Subsets Selection.
- Data splitting for variable selection.
- Stability selection.
- Knockoff filter.
- Conformal prediction.

Prerequisites

Knowledge of topics covered in the courses *Probability and Statistics M*, *Advanced Statistics M* and *Data Mining* (module of *Data Science M*) is highly recommended.

Teaching methods

Lessons are taught in classroom and lab.

Assessment methods

The exam consists in a _____

Textbooks and Reading Materials

- Efron, Hastie (2016) *Computer-Age Statistical Inference: Algorithms, Evidence, and Data Science*. Cambridge University Press
- Hastie, Tibshirani, Friedman (2009). *The Elements of Statistical Learning*. Springer
- Hastie, Tibshirani, Wainwright (2015). *Statistical Learning with Sparsity: The Lasso and Generalizations*. CRC Press
- Lewis, Kane, Arnold (2019) *A Computational Approach to Statistical Learning*. Chapman And Hall/Crc.
- Shalizi (2021). *Advanced Data Analysis from an Elementary Point of View*.
- Wainwright (2019) *High-Dimensional Statistics: A Non-Asymptotic Viewpoint*. Cambridge University Press

Semester

Second semester, first period.

Teaching language

The lessons are held in Italian, textbooks are in English.
