UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# SYLLABUS DEL CORSO

# Statistica Computazionale

**2122-3-E4102B085-E4102B087M**

## Learning objectives

**The course aims at introducing software and complex procedures for modelling statistical models both from the theoretical and from the applicative point of view**

**The student at the end of the course should be able to understand, discern and propose complex models and algorithms, being able to assess the studied topics analyzing read dataset.**

## Contents

**The course deals with complex/algorithmic  modelling techniques and main problems and algorithm for complex statistics**

## Detailed program

**(1)  SAS language and R ovierview**

**(2) Interpretation of complex linear Models (Anova, Ancova, GLM)**

**(3) Robust methods (Bootstrap, Jacknife, Robust Regression, IRLS, WLS, nonparametric regression,**

**loess smoothing and splines)**

**(4) Step of robust model building**

**(5) missing data mechanism, missing imputation, (y, X)-transformation, Influence, diagnostics, eteroskedasticity, model selection**

**(6) Binary and multinomial logistic regression**

## Prerequisites

**To pass the exam of "Analisi statistica Multivariata"**

## Teaching methods

**Class lessons and computer lab**

## Assessment methods

**WRITTEN EXAM: PROJECT WORK**

**Project work (also in group) involving a data analysis (R or SAS) on two dataset chosen by the student to replicate arguments and analyses discussed during lab sessions. Project works deal with the analysis of both:**

**1 Complete work on the construction of a robust model with quantitative target**

**(descriptive analysis, collin, missing data, heteroskedasticity, influence, trasformations, diagnostics, robust model construction, bootstrap)**

**1 More simple applied work with binary target (Binarize the previous quantitative target)**

**(Fit two models: with all covariates and with model selection/check only collinearity and separation)**

**The project work (doc, html, pdf, R markdown) should be sent by email (piergiorgio.lovaglio@unimib.it) one week before of the oral exam**

**Web portals for the choice of the dataset:**

**https://archive.ics.uci.edu/ml/datasets**

**www.kaggle.com**

**ORAL EXAM**

**The oral exam deals with questions on statistical THEORY (see arguments) and on the comments of outputs of the project work to assess the comprehension of principal statistical tools and consequently the "modus operandi" of the conducted statistical analyses.**

## Textbooks and Reading Materials

**Carter Hill, William E. Griffiths, Guay C. Lim.  Principles of Econometrics (chapters 2, 4 ,5, 6, 7, 8, 16 until section 16.3)**

**Gareth, Witten, Hastie, Tibshirani, An Introduction to Statistical Learning with Applications in R Chapter 3 (no section 3.5), Chapter 4, 6,7**

**Lucidi sul moodle**

**Recommended**

**Principles of Econometrics associate R book** https://bookdown.org/ccolonescu/RPoE4/

## Semester

**I semester , Cycle I**

## Teaching language

**Italian**