Bocconi University

Ph.D. program in Social and Political Sciences 2024/25

Statistics 40991

The duration of the course is 24 classroom hours. This course further discusses the fundamental concepts of statistical inference and modeling, with the aid of computer simulations (using the R program) throughout the course to deeply understand and apply the statistical concepts. The course is compulsory for the PhD program in *Social and Political Sciences*. Interested students from other PhD programs may however also take the course.

Topics that will be covered are:

1. Introduction to the statistical software environment R and to the use of computer simulations for the illustration of properties of procedures (download the R software at www.r-project.org; R Studio desktop at https://www.rstudio.com/products/rstudio/download/)
2. Principles of frequentist statistical inference: sampling distributions (in theory and in action)
3. Experimenting with convergence in probability and in distribution
4. Properties of point estimators, confidence intervals, tests of hypotheses
5. The (simple) linear model: illustration of the joint distribution of parameter estimators
6. General statistical models: Maximum Likelihood estimation and testing
7. Review of the multiple linear model with matrix algebra: testing nested models, inference

Materials

The text to be used as a reference is

> R.J. Pruim (2011). Foundations and Applications of Statistics: An Introduction Using R. American Mathematical Society, Providence, RI.

The book is *optional* - you do NOT need to purchase it (it is however also available in the UB library). Electronic (pdf) class notes will be made available after the lectures. The only crucial materials for the exam are your notes from lab sessions and from class, together with the material that will be distributed during the course. Make sure to practice with R at home!

Assessment

A combination of one assignment (30% of the grade) and a final written exam (70% of the grade) will determine the final grade. The assignment will be due prior to the final exam (date TBC).

Instructor

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