UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Big Data in Health Care

2122-2-F9101Q028-F9101Q028M

Aims

This course aims to provide the basic concepts of clinical epidemiology that are at the basis of a proper methodological approach to a research project in medicine. The student will be able to deal with big data in health care particularly focusing on several aspects including design, data management and analysis. The student will be able to implement optimal design strategies for clinical trials and observational studies. The student will be able to apply regression models for the analysis of time to event and longitudinal data and to use these models for risk prediction and for the assessment of causal relations between variables. The student will be able to use proper statistical methods for the analysis of genetic data.

Contents

Clinical epidemiology. Designs of clinical trials and observational studies. Statistical methods for time to event data, repeated measures data, risk prediction models, causal analysis. Statistical methods for the analysis of omics data.

Detailed program

Basics in clinical epidemiology.

Study design in medicine: cross-sectional, case-control, case-cohort, randomized trials, biomarker driven designs.

Statistical methods for time-to-event data, competing risks and multistate models, repeated measures data, risk prediction models (building and validation).

Penalized regression methods for the analysis of time-to-event data in omics.

Prerequisites

Descriptive and inferential statistics.

Teaching form

Lectures with the use of active methodologies (such as microsimulations) will be interspersed with computer labs in supervised small groups activities using R software. Critical reading of methodological clinical papers.

Textbook and teaching resource

Teaching slides.

The following textbooks are suggested:

Machin D., Campbell M.J. (2005). Design of studies for medical research, Chichester: John Wiley & Sons.

E. Marubini, M.G. Valsecchi (1995). Analysing survival data from clinical trials and observational studies, Chichester: John Wiley & Sons.

Vittinghoff, E., Glidden, D. V., Shiboski, S. C., McCulloch, C. E. (2005). Statistics for biology and health. Regression methods in biostatistics: Linear, logistic, survival, and repeated measures models. New York, NY, US: Springer Publishing Co.

Laird N.M., Lange C. (2011). The fundamentals of modern statistical genetics. New York, NY, US: Springer Publishing Co.

Semester

Second semester

Assessment method

The exam will consist of two tests:

- individual project concerning the analysis of big data to test the student's ability to apply the research methodology in clinical studies. The student's ability to develop a complete analysis using the R software and to correctly interpret the results will be assessed. The vote (out of thirty) will weigh 60% on the final judgment.

- questionnaire with multiple choice answers to test the preparation on the theoretical aspects of the overall program. The student's knowledge of some key concepts concerning both the design and the analysis of clinical studies will be evaluated. The vote (out of thirty) will weigh 40% on the final judgment.

Office hours

On request by e-mail.