UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Statistical Models for Cognitive Neuroscience

2526-1-F5110P006

Learning area

Methods, techniques and instruments for pscyhology
Statistics and quantitative methods

Learning objectives

Knowledge and understanding

- Statistics for correlation data
- Statistics for experimental data
- Simple and complex relationships among different types of variables
- Advanced concepts of measurement and design analysis in neuroscience

Applying knowledge and understanding

- Ability for analyzing data collected in different research designs
- Estimating and understanding relationships among variables.
- Employing and evaluating different types of research designs in neuroscience
- Ability plan and implement a research design
- Use of statistical software

Independent Judgment

- Students will develop the ability to understand and critically evaluate the quality of statistical analyses presented in the psychological and scientific literature.
- Students will learn to critically assess and select appropriate psychological measurement tools for research purposes.

Communication Skills

- Students will be able to report the results of statistical analyses clearly and accurately in academic papers and statistical reports.
- Students will acquire familiarity with APA guidelines and apply them effectively in scientific communication.

Learning Skills

- Students will enhance their ability to critically interpret statistical methods encountered throughout the program.
- Students will gain the competence to independently perform statistical analyses required for an empirical undergraduate thesis.
- Students will acquire technical foundations necessary for pursuing advanced research training (e.g., research-based master's programs or doctoral studies).

Contents

An overview of several statistical techniques and methodological concepts is provided, giving the student the ability to collect and analyze data in a wide range of research situations. Univariate and multivariate statistical techniques are presented, with emphasis on the interpretation of results. Fundamental concepts related with measurement in neuroscience are also discussed.

Detailed program

Lectures

1. Course introduction
2. Research methodology
3. Statistical inference
4. The general linear model (GLM)
5. Statistical interactions and non-linear effects
6. Analysis of means
7. GLM assumptions
8. Power Analsys for the GLM
9. Non-parametric tests and variable transformations
10. Applications
11. Generalized linear model
12. Linear mixed models
13. Repeated-measures designs
14. Means analysis with the mixed model
15. Generalized mixed models
16. Applications to neuroscienze

Lab

Applications of all the statitical techniques viewed in class with the statistical software jamovi

Project

Planning, implementing and analysing an empirical research project developed by the students. Interactive group work

Prerequisites

Descriptives statistics (measures of central tendency and dispersion); Basics of inferential statistics; regression and correlation; t-test.

Teaching methods

Theoretical and practical lecture-based lessons represent one-third of the meetings. In the theoretical lessons the foundations of the statistical techniques are presented and discussed, their applicability, with special focus on the interpretation of the results. Using several examples found in the psychological literature, students with different backgrounds should be able to understand what is needed to carry out and interpreting the statistical analyses discussed in the course.

One-third of the meetings is devoted to interactive practice sections in the computer labs with analyses of real data and discussion.

One-third of the meetings is devoted to group-based interactive development of a empirical research design, data collection and data analysis.

Although this course is held in Italian, for Erasmus students, the course material is available also in English, and students can take the exam in English if they wish to do so.

Assessment methods

Written final test with open-end questions based on data analyses. Optional oral exam.

Open-ended questions (3 to 5) will assess the ability to apply this knowledge for developing research projects and for analyzing data. The student will be assessed on their ability to understand a research design, select the statistical techniques useful to answer the researcher questions, execute them with the statistical software, interpret and report the results following international standard (APA)

The possibility of an oral exam is offered to students who consider that the result of the exam does not reflect their real competence and it will assess both theoretical knowledge and practical abilities. The oral exam mark with be averaged with the written exam mark to compose the final grade.

Textbooks and Reading Materials

Learning materials is available consists of the lectures slides and the textbook. Papers regarding specific topics can be also indicated. Lecture slides and papers will be made available in the University’s online elearning platform.

Textbook 1: Gallucci, M. Leone L Berlingeri, M (2017). Modelli statistiche per le scienze sociali. Milano: Pearson Education.

Sustainable Development Goals

QUALITY EDUCATION