UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Informatics for Environmental Data Analysis

2627-3-E3201Q117

Aims

The course content is designed to provide students with the fundamental knowledge necessary to design and compile frameworks for the analysis of environmental data.
Specifically, the course aims to:

- explore, manage, and manipulate datasets of environmental data (including physical, chemical, meteorological-climatic, geological, biological, and ecological data), whether observational or experimental in nature
- compute descriptive statistics
- graphically represent data distributions
- identify the appropriate statistical analysis to answer specific scientific questions based on the data collected or available
- graphically present results and interpret their meaning

In accordance with the Dublin Descriptors, the course aims to achieve the following learning outcomes:

- Knowledge and understanding. By the end of the course, students will have acquired knowledge of the fundamental principles of environmental data management, processing, and analysis, as well as the main statistical methods used to address scientific questions. They will also be familiar with the basic features of the R programming language for data analysis.
- Applying knowledge and understanding. Students will be able to use R to import, explore, manage, and manipulate environmental datasets, compute descriptive statistics, select the most appropriate statistical analyses, produce graphical representations of data, and develop simple reproducible data analysis workflows.
- Making judgements. Students will be able to critically assess data quality, identify the most appropriate analytical procedures based on the scientific question being addressed, and interpret the results within the context of the environmental issues under investigation.
- Communication skills. Students will be able to present and discuss the results of data analyses using graphs, tables, and outputs generated in R, employing appropriate scientific terminology and accurate

technical language.
- Learning skills. Students will be able to independently expand their knowledge of R by consulting the official documentation and the scientific literature, applying the acquired skills to new datasets and environmental data analysis problems.

Contents

Exploration, management and handling of environmental datasets; analysis and graphical representation of data using an IT approach and interpretation of results.

Detailed program

In detail, the course will deal briefly from a theoretical point of view, and more extensively from a practical point of view, the following topics:

- Exploration and manipulation of data
- Graphical representation of data
- Analysis of data with normal distribution by means of linear models.
- Analysis of data with non-normal distribution by generalized linear models
- Data mining
- Spatially explicit models

Prerequisites

Basic statistics concepts acquired through the course "Mathematics and Statistics"

Teaching form

The teaching activity will be organized in practical activities (40 hours of Interactive Teaching).

Three- four-hour lab activities (LIBaaS), in person, Interactive Teaching

- Activities in wired classroom, overall 4 credits, 40 h.

Textbook and teaching resource

An illustration of the textbooks, with their characteristics, will be provided during the first frontal lesson. Between these:

Justin C. Touchon. Applied Statistics with R. A Practical Guide for the Life Sciences.

Oxford University Press (2021) - Consigliata la versione e-book

Semester

The lectures and the practical part will be delivered in the third year of the course in the first semester.

Assessment method

Written exam.
The task will be aimed at assessing students' disciplinary problem-solving skills. During the exam, students may consult notes taken during lectures or practical sessions, textbooks, and online resources.

Oral exam (discussion based on the written exam).
Passing the written exam grants access to a brief oral exam aimed at verifying the level of knowledge, skills, and the student's ability to explain the concepts addressed in the written test, as well as those covered during lectures and practical sessions.

A total of 7 official exam sessions are scheduled during teaching breaks.

Office hours

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Sustainable Development Goals

LIFE BELOW WATER | LIFE ON LAND