UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Big Data in Geographic Information Systems

2425-2-FDS01Q024-FDS01Q025M

Learning objectives

The aim of the module is to enable students to have a basic competence to manage and analyze georeferenced data. The teaching module is part of the offer in the statistics and informatics disciplinary area.

Contents

Module 1: Introduction to geospatial data

Module 2: Observational data in climate sciences

Module 3: Climate models

Module 4: Analysis of climate data

Module 5: Synthesis and final remarks

Detailed program

The frontal lessons (2 hours per module) will present some background on the field of application, with specific attention to the relation between the data and the system that generated them, providing the theoretical tools for their management.

The practical sessions (3 hours per module) will provide the software tools for geospatial data handling, visualization and analysis. Python will be used for examples shown by the teacher and for students individual or

group exercises. Small assignments are foreseen, due by the last week of classes (a malus of 2/30 will be applied for every assignmnet not delivered on time).

Module 1 will introduce the topic of geospatial data, including data types, and basic concepts related to cartography and Geographic Information Systems.

In Modules 2-4 examples and applications will be drawn from the domain of climate science. Different geospatial data types will be presented, including from observations of the physical world (M2) and from computer model simulations (M3), each characterized by different features and challenges. Integrated data analysis applications, ranging from simple hypothesis testing to space-time pattern recognition, will be introduced (M4).

A review of the main concepts will be carried out in Module 5, along with questions from students, correction of the assignments, and final examples.

Prerequisites

Basic knowledge of Python.

Teaching methods

5 two-hour lectures (delivered didactics, in person)
5 three-hours laboratory sessions (interactive teaching, in person)

Assessment methods

Oral exam: 50% presentation and discussion of a final individual project, 50% topics and assignments from the course.

The discussion of practical examples and assigments (by then reviewed during the last lesson) aims at verifying the understanding that students have of specific passages for the solution of data analysis and visualization problems.

The presentation and discussion of a final individual project aims at testing the students' ability to autonomously develop a data analysis application appropriate for the topics of the course, by applying both methods presented in class and techniques acquired elsewhere with the master program in data science.

Textbooks and Reading Materials

Teacher slides; links to scientific papers and webpages. Distributed via elearning.

Semester

Second semester

Teaching language

English.

Sustainable Development Goals

CLIMATE ACTION