Course Title: Analysis and Modelling of Time Series and Spatial Data

Instructor:
Fabio Gennaretti

Credits:
4 CFU

Total Hours:
24

Objectives:
In agriculture, forestry, and ecology, we often encounter temporal and spatial data, which have specific characteristics and intrinsic properties that must be considered for accurate analysis. This course focuses on the study and modelling of time series and spatial data, covering their properties and appropriate analytical approaches.

Module 1: Time series analysis

1. Introduction to different types of temporal data and their properties: trend, seasonality, cycles, decomposition, autocorrelation
2. Time series analysis and modelling
3. Practical exercises in R

Module 2: Spatial data analysis

1. Introduction to different types of spatial data and their properties: point data, areal data, geostatistical models
2. Analysis and modelling of spatial data
3. Practical exercises in R

Program:

- **Lecture 1 – Time series analysis**
  - Temporal dependence
  - Properties of time series
  - ARIMA models for time series
  - Producing forecasts from a model
  - Temporal correlations in additive and Bayesian models
- **Laboratory Class 1**: Fitting ARIMA models in R
- **Laboratory Class 2**: Temporal correlations in additive and Bayesian models
- **Lecture 2 – Spatial Data Analysis**
  - Point pattern analysis
  - Geostatistical models
  - Areal data
  - Spatial correlation in complex models

- **Laboratory Class 3**: Point patterns in R
- **Laboratory Class 4**: Geostatistical models and areal data in R

Course Schedule:

Students will attend approximately 8 hours of lectures and 16 hours of laboratory classes.
The course will take place in June-July 2025.

Enrollment:

To enroll, please contact *Fabio Gennaretti* at f.gennaretti@staff.univpm.it.

Room:

To be determined based on the number of PhD students; remote online attendance is possible.

Prerequisites:

R and the required R packages should be installed prior to the beginning of the course.