Quantitative methods in plant ecology
LV-19-050-227 (LV-19-d19-027)
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Course description

Ecology integrates observations and biophysical principles to understand how the biosphere works. In practice, this huge task relies on performing data analyses in the light of theoretical ecology. Data can be gathered from observational, experimental, and modeling efforts, but despite the data origin, a set of principles and methods are common to data analysis in ecological studies. These principles and methods along with the tools to apply them are the focus of this course. Importantly, there is an emphasis on data and analysis visualization.

The course will be taught and evaluated in English.

Intended Learning Outcomes:

With this course, the students will:
- Identify sampling and analytical methods both when answering their own research questions and when reading papers on ecology.
- Perform data exploration as part of good practice in ecological research
- Implement R packages commonly used in ecological analyses
- Manipulate real data gathered in different ecosystems

Resources:

Instead of a textbook, selected readings for each week are included in the program. These readings expand and introduce concepts and techniques and correspond to the class prep. Therefore, a short discussion on these selected readings will start each session. In addition, a companion reading on data visualization at the student's pace is needed to ensure a common ground when presenting data and analysis.

Regarding R, three resources are recommended:
- **YaRrr! The Pirate's Guide to R**, Phillips 2018.
- **R-Uni A List of 100 Free R Tutorials and Resources in University webpages,** Piboonrungroj 2012.
- **knitr Elegant, flexible, and fast dynamic report generation with R**, Xie 2012.

Evaluation:

This course will be graded from two components active attendance and a final project.

Attendance: It is expected that students attend to, at least, 75%.

Project: A final project will allow students to implement the concept and methods while handling a real dataset. The goal is to build a concrete report presenting the data set, setting a research question, identifying, and applying a quantitative method to address that research question. A project roadmap will be introduced in a practical session and a rubric, the tool to evaluate, will be crafted along with the students.

QUANTITATIVE METHODS IN PLANT ECOLOGY - PROGRAM

Week	Date	Topic	Main responsible	Practice goal	Class Prep
1	24.10	Presentation & diagnostic	Presentation (MB) Plant Ecology Example (LAR)		
2	31.10	Sampling, experimental design	LAR	Short discussion*. Data wrangling	Underwood (1997)
3	07.11	KYD: Know your data.	MB MB	Intro to R.	Zuur et al. (2010) (Pages 1-8) Steps 1 to 4
4	14.11	Data exploration	MB	Environmental variables	Zuur et al. (2010) (Pages 9- 13) Steps 5 to 8
5	21.11	Hypothesis testing	LAR MB	Mean comparison	Cumming et al. (2007)
6	28.11	Multivariate analysis.	MB LAR	MDS on the facilitation dataset	Clarke and Warwick (2001) Chapter 1
7	05.12	Ordinations	LAR MB	Environmental variables PCA	Clarke and Warwick (2001) Chapter 4 and 5
8	12.12	Classification	MB MB	Group Tropical Dry Forest	Dryfor (2016)
9	19.12	Introduction to regression analysis: LM	MB LAR	Project setting: Route Map	Smith and Warren (2019)
10	09.01	Models in Ecology	MB LAR	Building the project rubric	Anderson (2002)
11	16.01	GLM	MB	Riparian datasets	Yang et al. (2022)
12	23.01	GMM	MB	Mangrove dataset	Wilke, 2019
13	30.01	Project consultation	LAR, MB		Topic source(s)
14	06.02	Last time of project consultation	LAR, MB		Grainger et al. 2022

* In each session