

Code: ECO410033

Course name: Introdução à análise multivariada (Introduction to multivariate data analysis; IMPORTANT: ALL LECTURES WILL BE TAUGHT IN PORTUGUESE)

Credits: 4

Professors: Dr. Luis C. P. de Macedo Soares (2 credits), Dr. Thiago C. L. Silveira (1 credit), Dr. Eduardo L. Hettwer Giehl (1 credit)

Year/Semester: 2019.2

Period: August 08 to September 26

Schedule: every Thursday (mornings 8-11 am and afternoons 1-5 pm)

Number of students: 20

Location: to be assigned

Office hours: Room 224 B and Room 222 B, Fritz Müller (ECZ) Building

Pre-requisite: Basic Statistics (Estatística Básica) or Biometry

Syllabus:

Introduction to multivariate data analysis; Main R packages; Introduction to multivariate data, types of data used in ecological studies and correlated areas; Q-mode and R-mode data and analysis; Data transformation and standardization; Distance and (dis)similarity measures, and association matrices; Hierarchical Cluster Analysis and Indicator Species Analysis; Unconstrained ordination; Constrained Ordination; Testing hypotheses with multivariate data (PERMANOVA, GLM_{mv}).

Methodology:

The course will encompass lectures and practical assignments using the free software R and additional readings aiming to cover the key theoretical topics. Discussions about how multivariate data analysis may be of use on student's own data will be fostered.

Assessment of students' performance:

Frequency and participation in lectures and other activities developed in R, after the end of each lecture.

Detailed schedule:

When?	What?
August 8 (Luis and Thiago)	Introduction, multivariate data structure, Q mode and R mode, data standardization and transformation
August 15 (Luis and Thiago)	Distance and (dis)similarity measures, association matrices
August 22 (Luis)	Hierarchical Cluster Analysis, Indicator Species Analysis (IndVal)
August 29 (Luis)	Introduction to ordination methods, Principal Component Analysis (PCA)
September 5 (Thiago)	Principal Coordinate Analysis (PCoA) and non-metric Multidimensional Scaling (nMDS)
September 12 (Luis)	Canonical ordination, Redundancy Analysis (theory and practice), Canonical Correspondence Analysis

September 19 (Eduardo)

Testing hypothesis in multivariate data: ANOSIM, PERMANOVA and Mantel test. A brief introduction to restricted data permutation.

September 26 (Eduardo)

Linear Models (LM_{mv}) and Generalized Linear Models (GLM_{mv}) for multivariate response data.

References and links:

- Borcard D., Gillet F., Legendre P. (2011). Numerical ecology with R. Springer, London.
- Gotelli N.J., Ellison A.M. (2011). A Primer of Ecological Statistics. Oxford University Press.
- Legendre P., Legendre L. (1998). Numerical Ecology. Elsevier, Amsterdam.
- Lepš J., Šmilauer P. (2003). Multivariate Analysis of Ecological Data using Canoco. Cambridge University Press, Cambridge.