

# Homework: Week 6 (Due Monday, November 4, 2024)

## FW 599: Multivariate Analysis of Ecological Data

### Instructions

Please submit all homework assignments to Canvas as an **R markdown document** (Markdown or Quarto) including **visible code** and **relevant output**. A tidy \*.pdf document is preferable to an \*.html or a “raw” \*.qmd file. Note that homework questions are intended to directly accompany lab exercises, building up to the final class project. Consequently, it is in your best interest to answer them thoroughly and thoughtfully.

### Questions

**Question 1)** Constrained ordination is a type of ordination whereby the axes are constrained by environmental factors. For your dataset, which are the “response” variables and which are the “predictor” or “environmental” variables? Alternatively, do you think a symmetric analysis is more appropriate for your data (as opposed to an asymmetric or hypothesis-testing approach), and if so, why?

**Question 2)** Perform a Redundancy Analysis (RDA) on your dataset (you can use a simple, transformation-based, or distance-based approach, but justify your choice!). Interpret the results by discussing the relationship between the response and predictor variables. What percentage of variance in the response data is explained by the predictor variables? Provide R output and visualizations (e.g., RDA triplots) to support your analysis.

**Question 3)** Next, perform a Canonical Correspondence Analysis (CCA) on your dataset. Compare and contrast the results of the RDA with the CCA. Discuss the assumptions made in RDA and CCA and whether they are met by your dataset. How do the results differ in terms of species-environment (or other response-predictor) relationships?

**Question 4)** Conduct a Co-inertia Analysis (CoIA), even if your “Y1” and “Y2” matrices are better suited for a directional hypothesis. How do the two datasets relate to one another? Use the RV coefficient to assess the strength of the shared structure between the datasets.

**Question 5)** Based on the analyses you conducted (RDA, CCA, CoIA), summarize the main ecological insights gained from your data. What limitations did you encounter in your analysis and how might they affect your interpretations? Which method do you feel is most appropriate for your data and why?