Homework: Week 7 (Due Tuesday, November 12, 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) Use the `anosim` function in R to run an ANOSIM on your response matrix, testing for among-group differences based on a categorical variable of your choice. If you do not have pre-determined categorical variables, you can generate them using a cluster analysis on an associated continuous predictor variable matrix. Provide a full statistical interpretation of your results.

Question 2) Now use the `adonis2` function to run a PERMANOVA on the same response matrix and using the same categorical variable. What does the statistical output say about among-group differences?

Question 3) Compare ANOSIM and PERMANOVA in terms of their assumptions, sensitivity to data structure, and when each method might be more appropriate for ecological data analysis. Which method do you feel is most appropriate for your data based on its structure and the study question(s) of interest?

Question 4) Run a SIMPER analysis on your dataset to identify the descriptors contributing the most to dissimilarity among two or more groups of your choice. What does this say about your ecological system?

Question 5) Discuss the rationale behind using permutation tests in multivariate data analysis. Why are these tests particularly useful in ecological studies, and what limitations should be considered when interpreting results?