= Practical Stats

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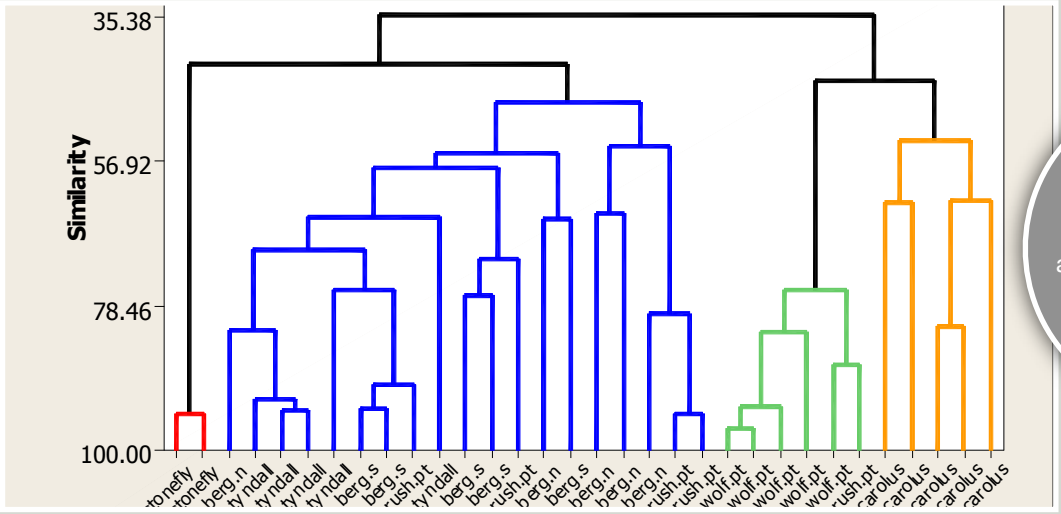

NMDS, Dendograms and Biplots

are 3 of the many useful methods for visualizing multidimensional data

Untangling Multivariate Relationships

Turn confusion into recognizable patterns -- NOW with methods for nondetect data!

Environmental measurements often are simultaneously recorded as a series of variables or species. Multiple chemicals are analyzed. Multiple measures of ecosystem health are recorded. If statistics are computed on each, one by one, the interrelations among variables, species and locations cannot be seen. Valuable information is lost. Multivariate methods resolve what at first may look like noise into recognizable patterns, providing new insight into your data. Which chemicals are increasing while the clean-site organisms are becoming more scarce?

These methods can seem daunting to many scientists, with acronyms like PCA and CCA and with unfamiliar terms like varimax rotation and detrended correspondence. UMR covers the multivariate methods of primary interest to environmental science, focusing on what each method is designed to do, when to use them, and when not to. How and why methods work are explained with minimal mathematics. Methods suitable for ordination of censored data (data with nondetects) are highlighted. By the end, the choice of which method to use, and how to use it, simply makes sense.

One on One Instruction
Class sizes are kept small enough that instructors are able to work with students during exercises, enabling them to make sense of their data.

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Untangling Multivariate Relationships

Course Outline

DAY 1

Intro to Multivariate Methods
- goals and objectives of each
- classification vs inter-dependence
- availability of software

Graphing Multivariate Data
- visualizing patterns in 3+ dimensions
- Biplots, Score plots
- Matrix and draftsman plots
- Graphs with parallel and polar coordinates
- Nonmetric multidimensional scaling (NMDS)

Principal Component Analysis
- what PCA accomplishes
- how PCA is computed
- Interpreting scores and loadings

Factor Analysis
- what FA can and cannot accomplish
- differences between FA and PCA
- how many factors?

Correspondence Analysis
- CA objectives
- relation to contingency table tests
- plot of associations
- Detrended CA

Cluster Analysis
- Methods of clustering. Linkages
- How well can known clusters be identified?
- Determining the number of clusters
- Interpreting dendograms

DAY 2

Discriminant Analysis & Logistic Regression
- Classifying observations into groups
- Assumptions and method mechanics
- Parametric (DFA) vs nonparametric (LR) methods
- Cross Validation to determine accuracy
- Exercise: DFA & Logistic on air quality data

Canonical Correlation and Canonical Correspondence Analysis
- Correlations between sets of variables
- What can and cannot be accomplished
- Tests for significant correlations
- CanCorr between species and site characteristics

Nonparametric Methods
- Nonmetric multidimensional scaling
- Nonparametric MANOVA to differentiate groups
- Multivariate trend tests
- Determining which variables contribute most to group differences

Methods for Censored Data
- Problems with substitution
- Binary methods for ordination: 1 limit
- Ordinal methods for ordination: 1 limit
- Trends, PCA, cluster, NMDS on data with multiple reporting limits