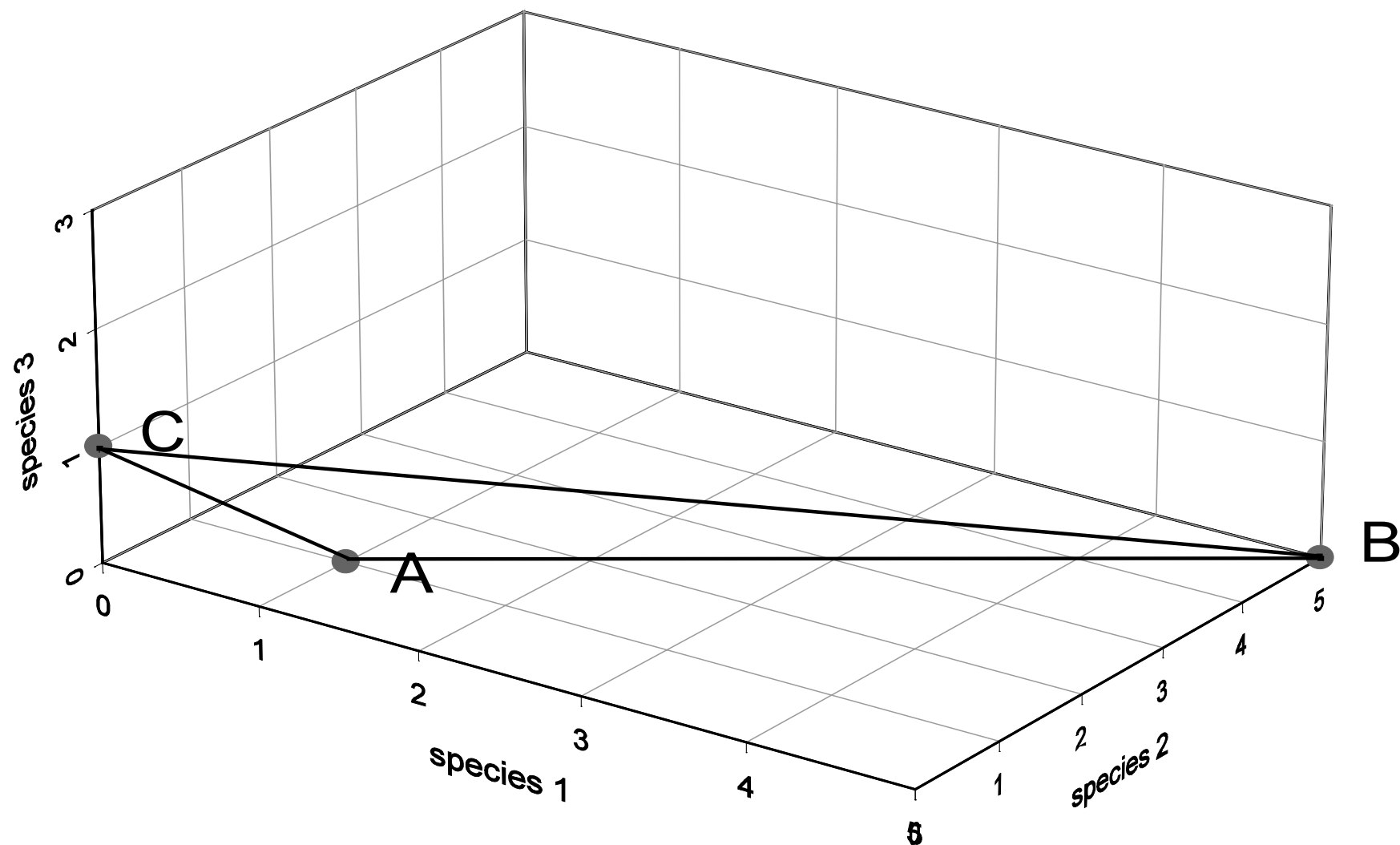


# $\beta$ -Diversity: Ordination and Comparisons

November 1, 2019

# Beta Diversity: How different are sites?

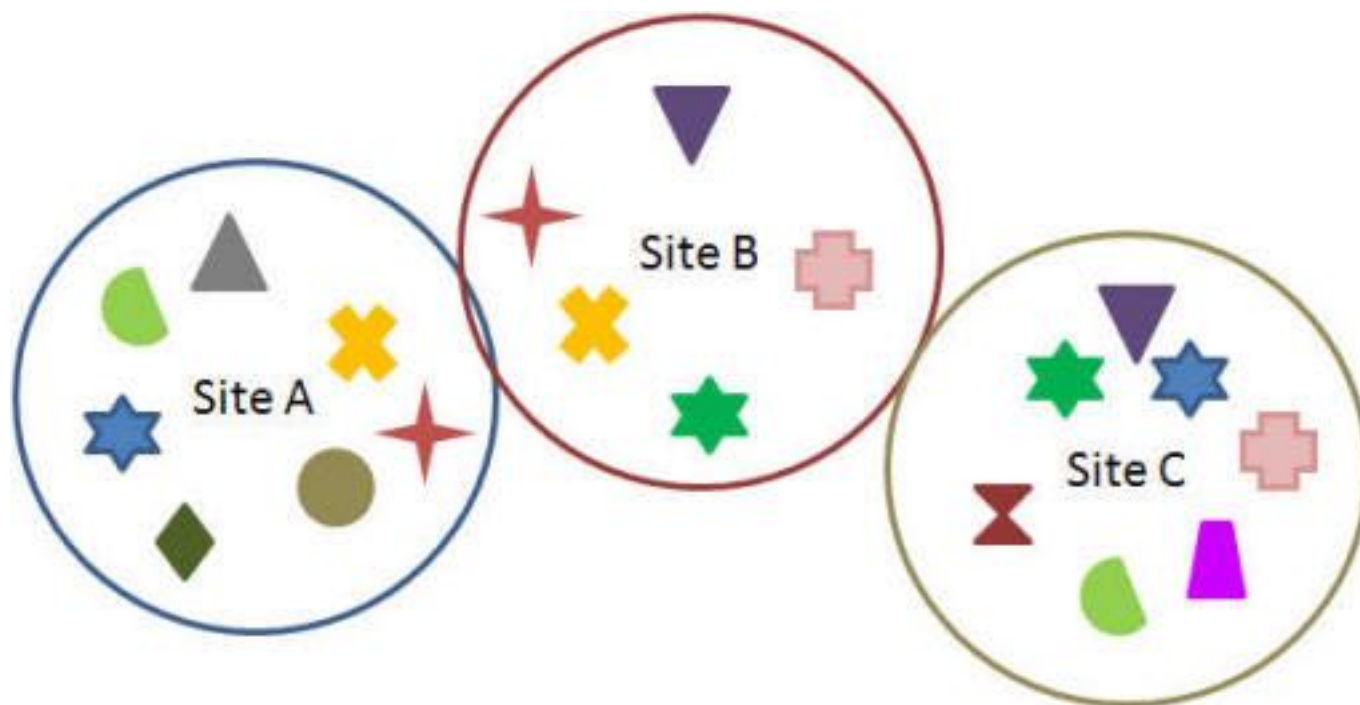


# Beta Diversity Metrics

- Number of Taxa
- Bray-Curtis Dissimilarity
- UniFrac
- etc

# Number of Taxa

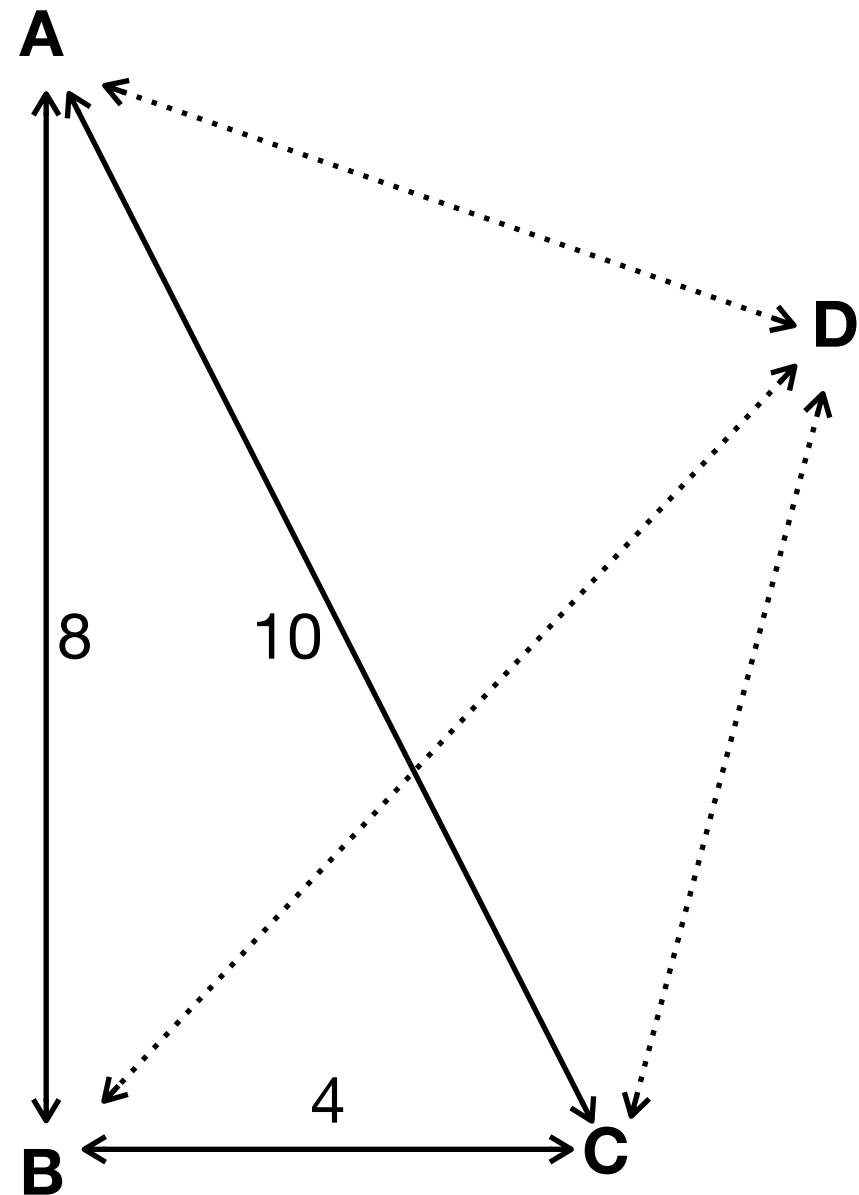
- How different are samples?



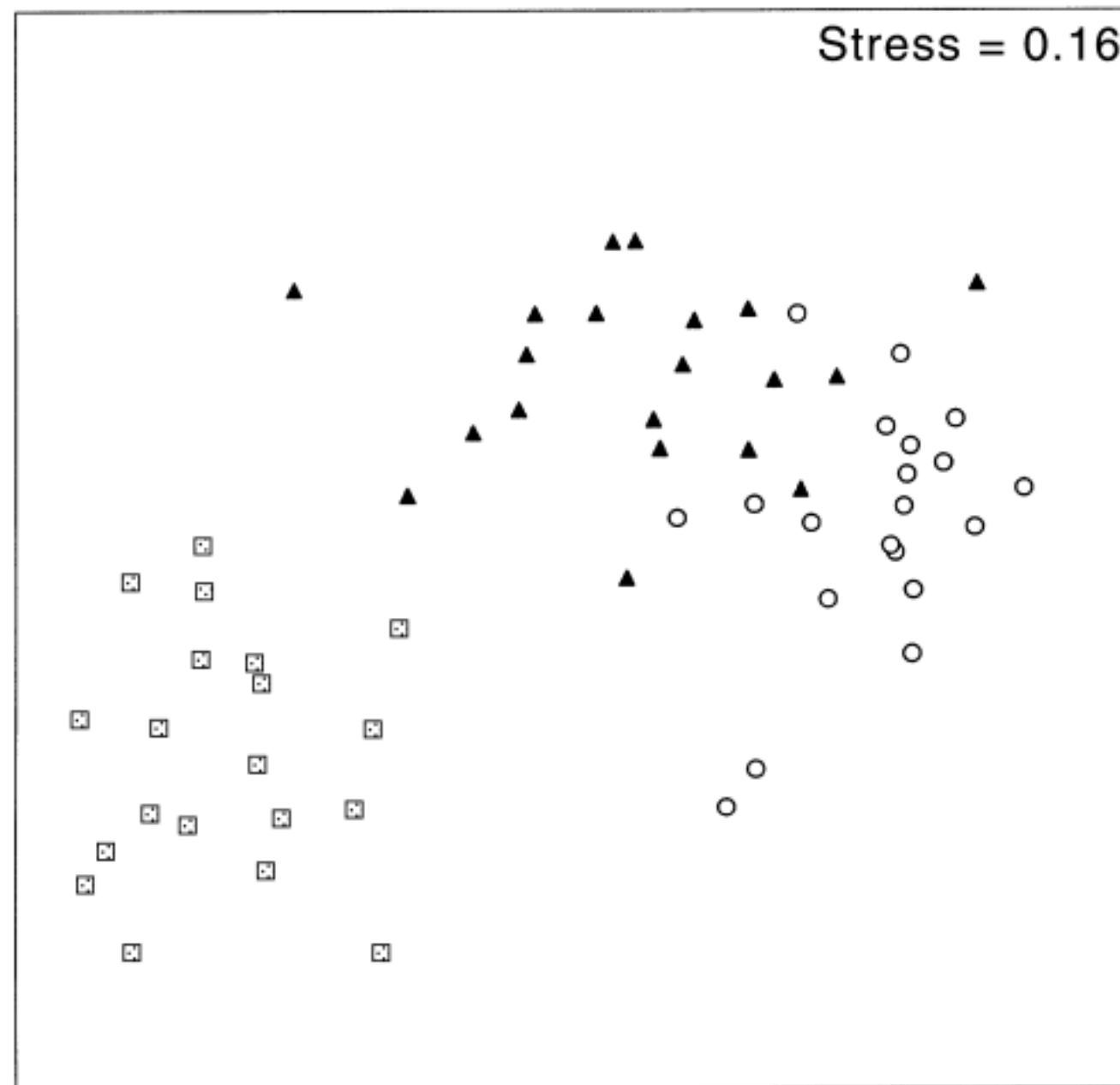
	Species Differences
<b>A vs B</b>	8
<b>B vs C</b>	4
<b>A vs C</b>	10

# Dimensionality reduction

	Species Differences
<b>A vs B</b>	8
<b>B vs C</b>	4
<b>A vs C</b>	10



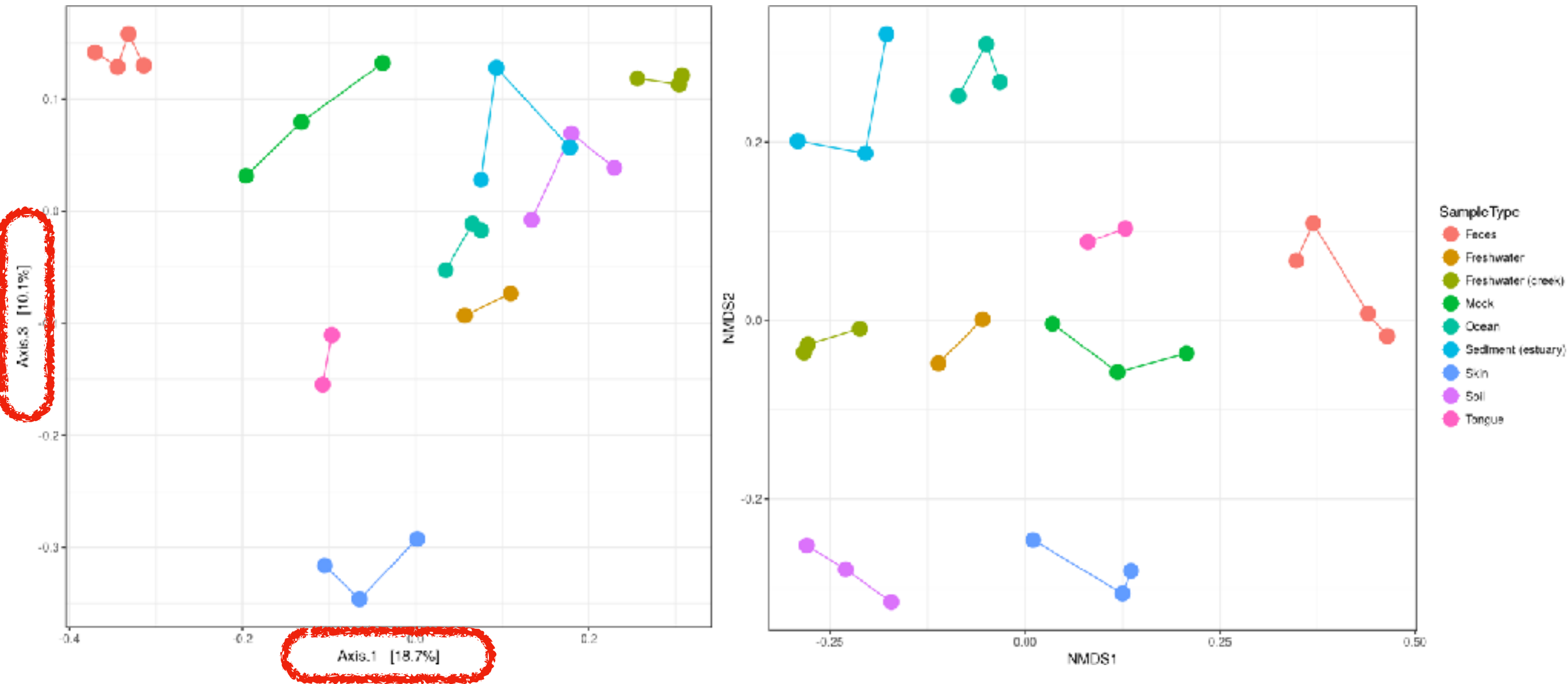
# Dimensionality reduction



# Dimensionality reduction

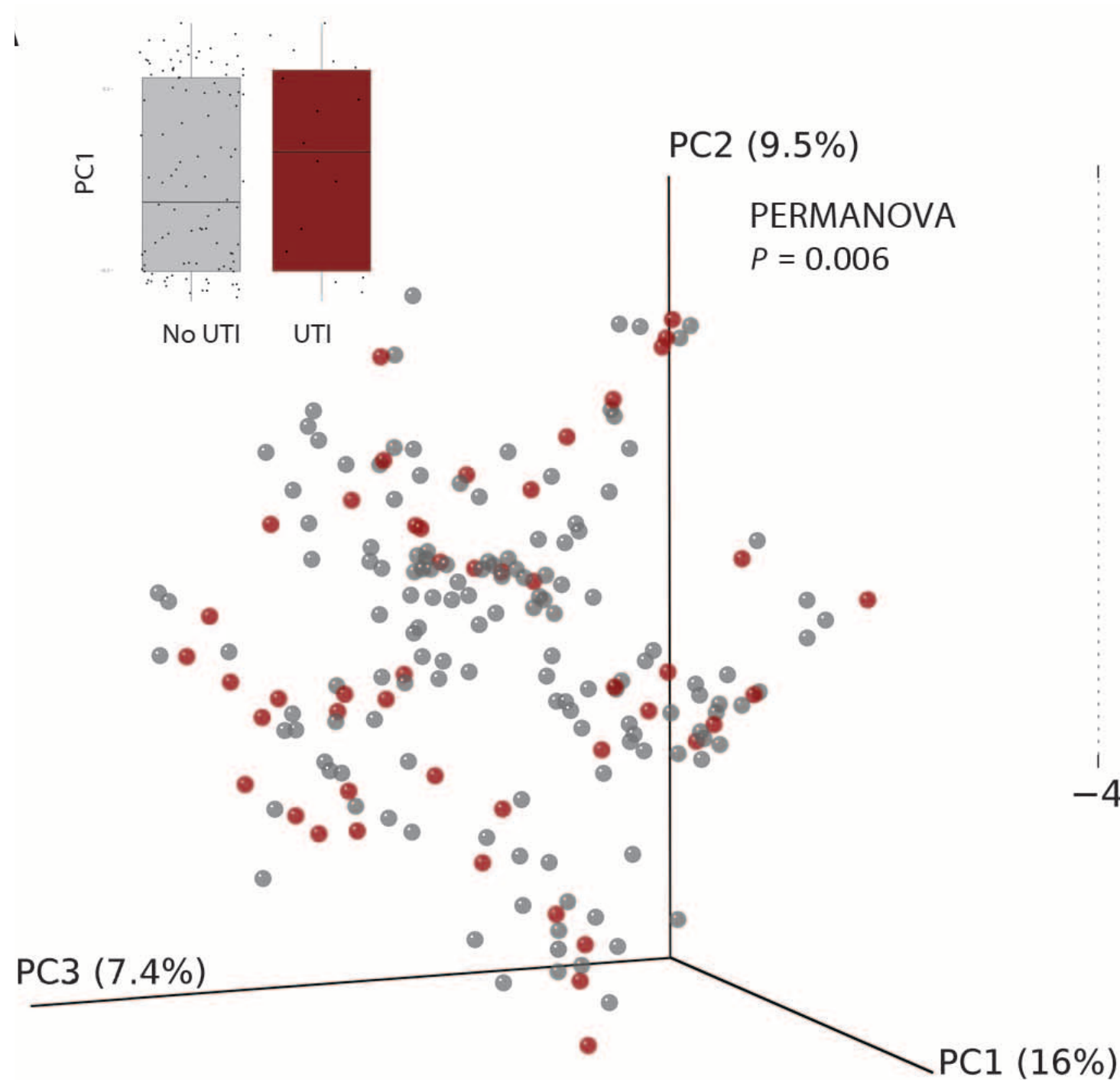
- **NMDS (Nonmetric Multidimensional Scaling):** attempts to maintain pairwise dissimilarity
- **PCoA (Principal coordinates analysis):** Determines axes along which variance is maximized

# PCoA and NMDS

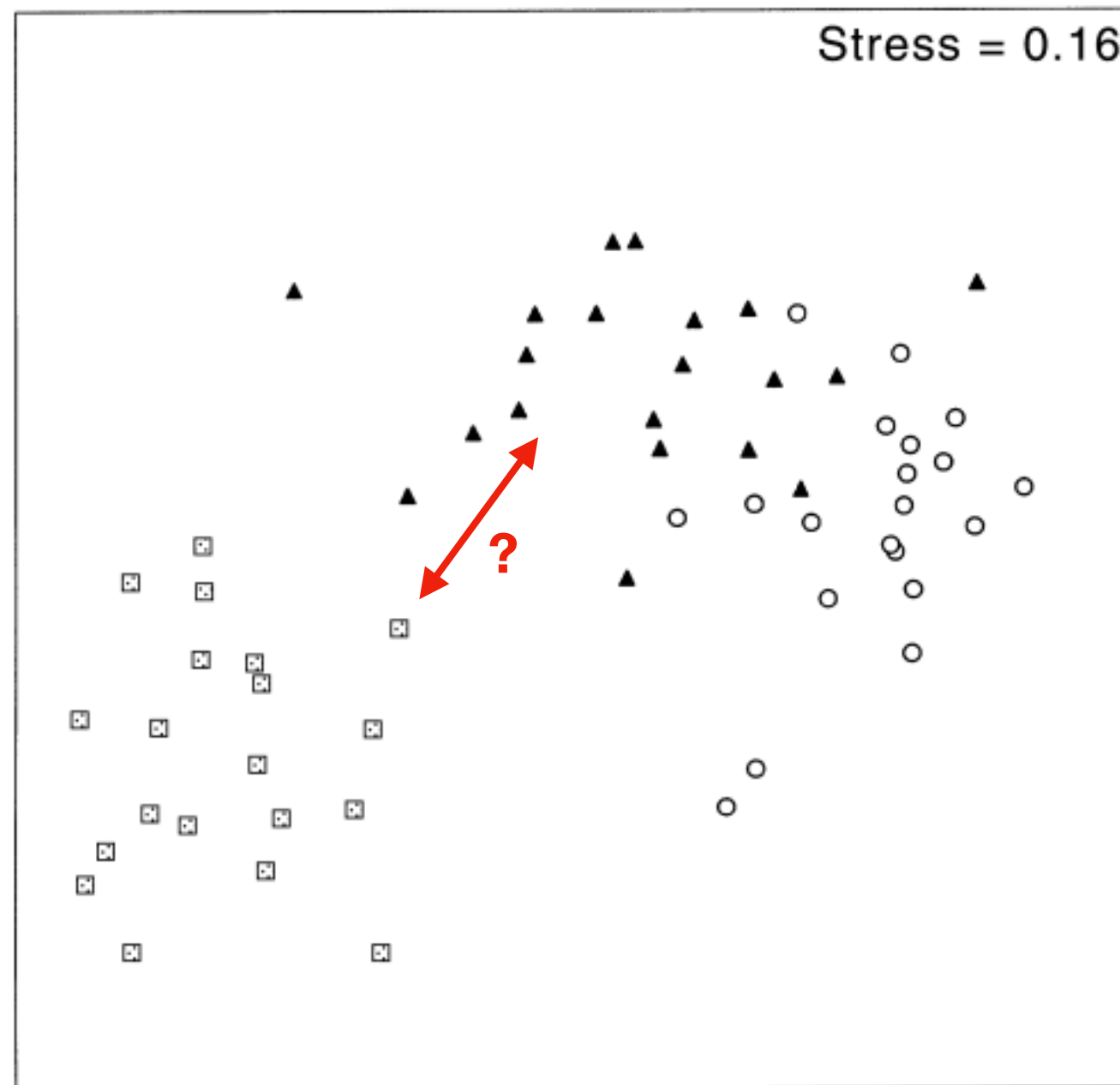




# Figures Josh Hates: 3D PCoA Plots

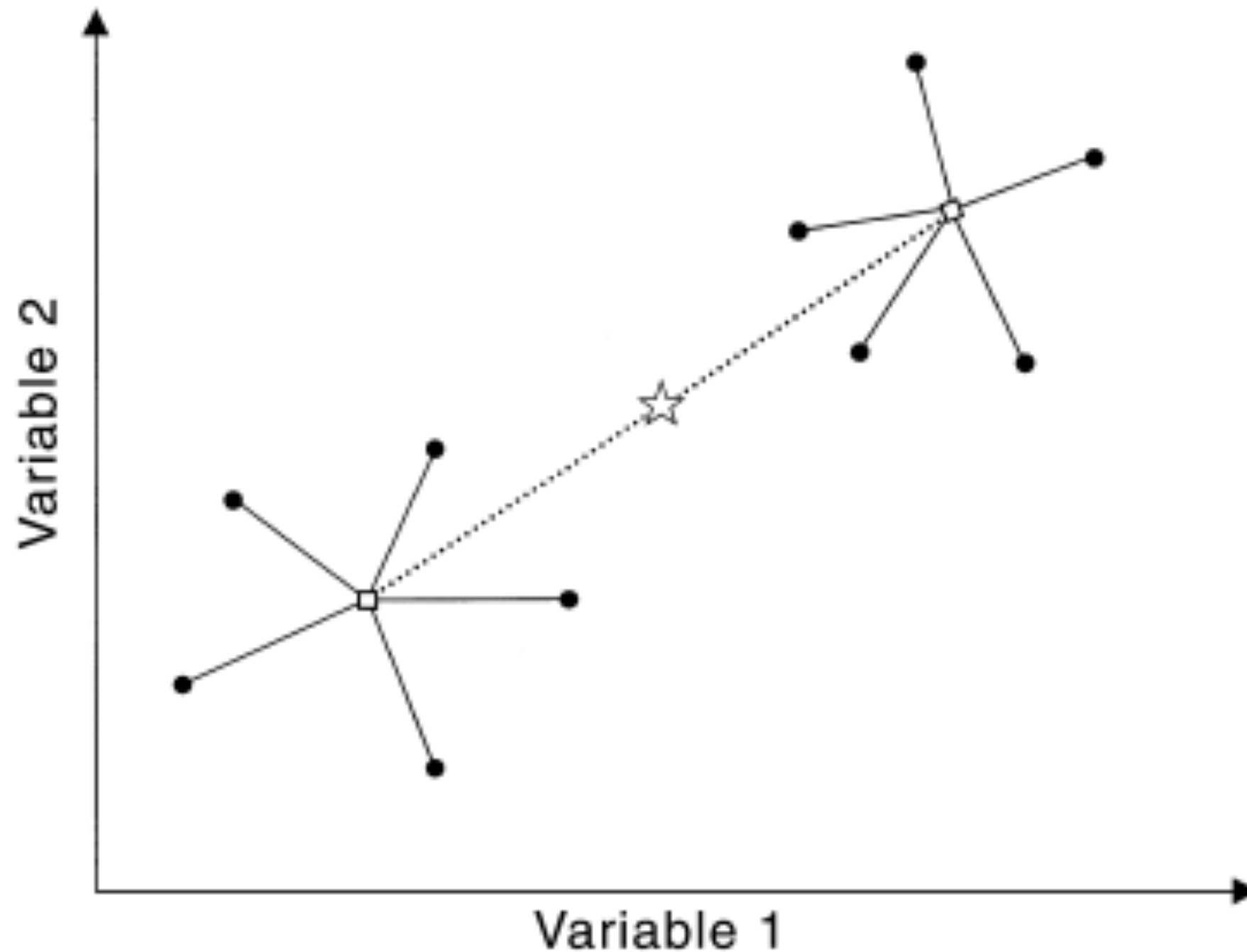


# Non-Parametric Multivariate Tests

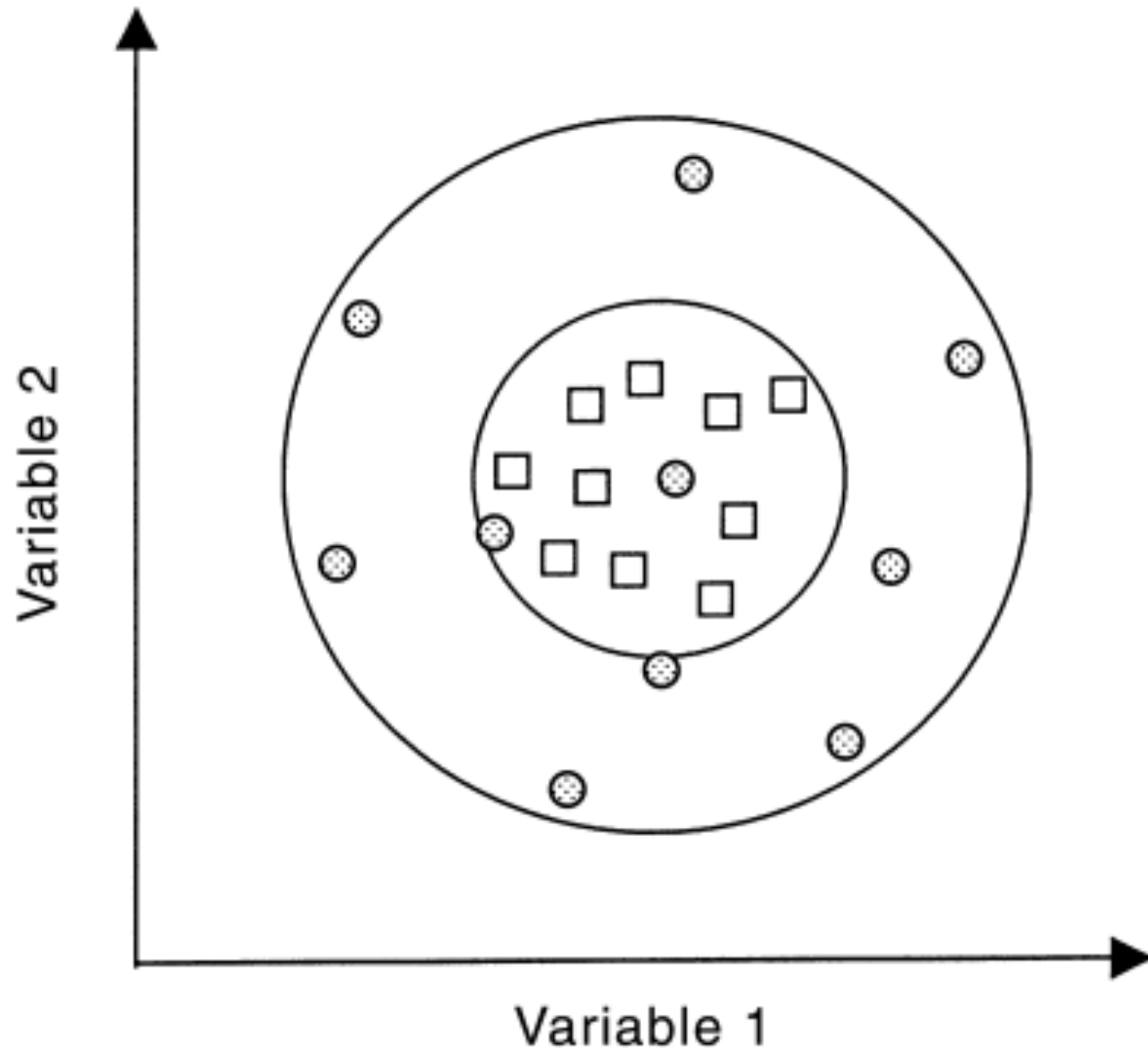


▲ Cats  
○ Dogs  
■ Rabbits

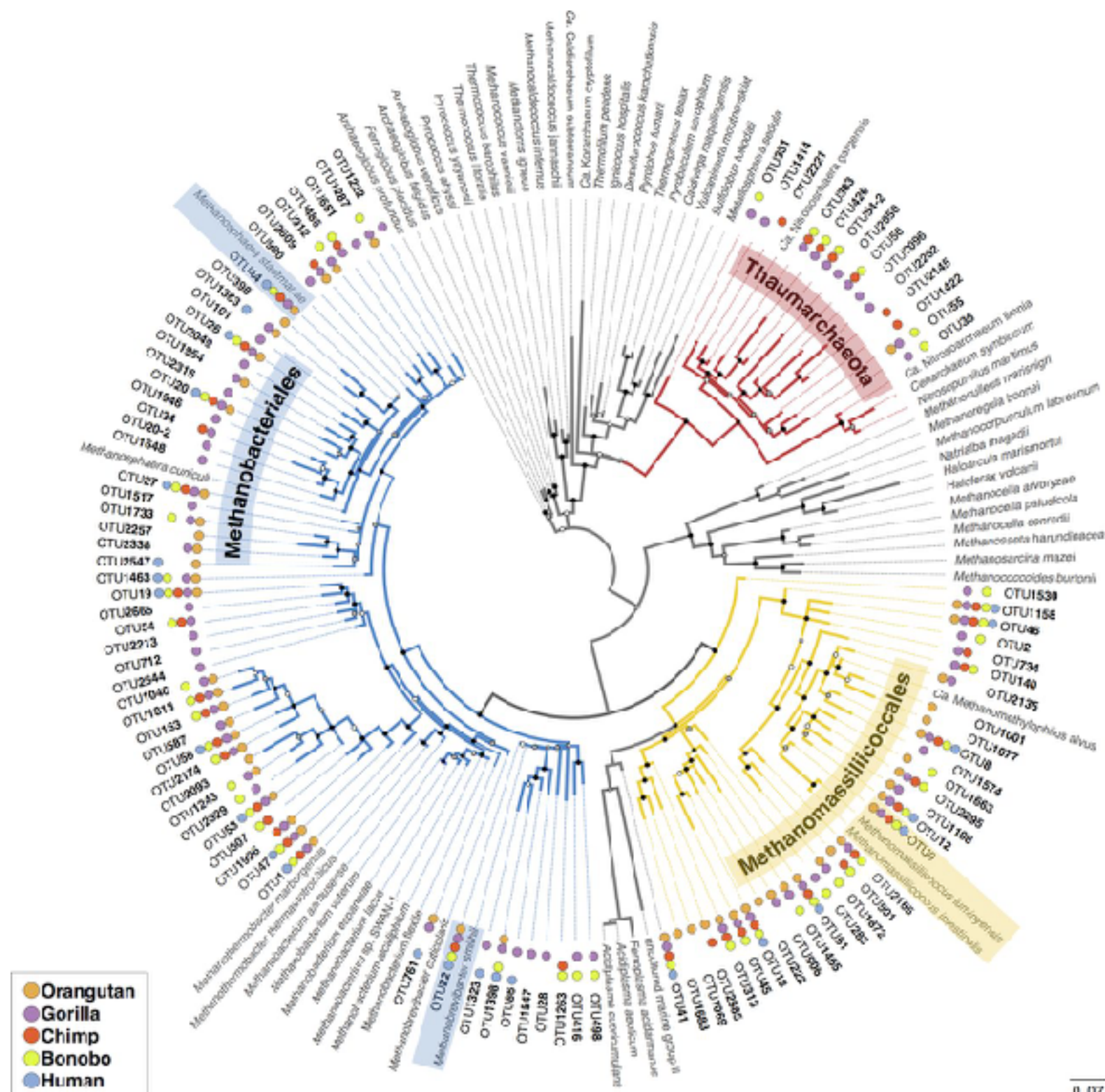
# PERMANOVA



# PERMANOVA Caveat



# Phylogenetic Trees



**N >> P**

	OTU 1	OTU 2	...	Meta 1	Meta 2	...
Sample 1						
Sample 2						
...						
Sample N						

P

N

# Machine Learning

- Random Forests
- Support Vector Machines
- Kernel Ridge Regression
- Regularized Logistic Regression
- Bayesian Logistic Regression
- K-Nearest Neighbors
- Probabilistic Neural Networks
- etc