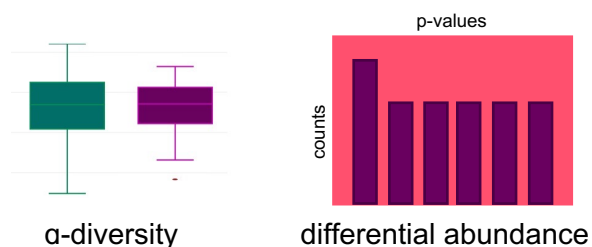


## allergy $\Rightarrow$ microbiome

**Pair-matching:** allergic or non-allergic?



**Randomization-based inference:**



**Conclusion based on:**

- adjusted p-values
- multiple pair-matching criteria
- composition consistency

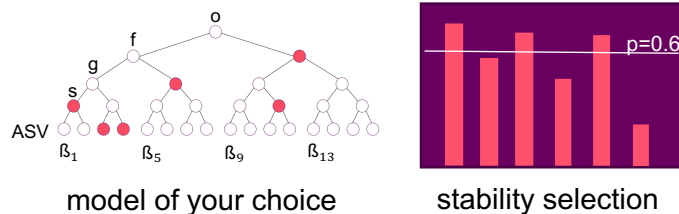


## allergy $\Leftarrow$ microbiome

**Classification or regression on:**

$$Y \sim \text{ASVs} + \text{[Clipboard]} + \text{[Test Tube]}$$

**Model comparison:**



**Conclusion based on:**

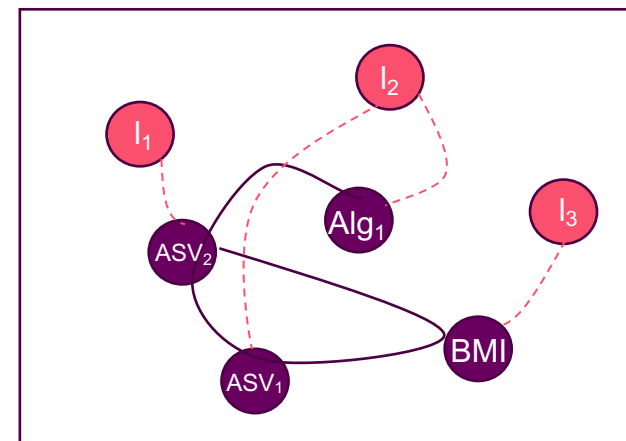
- model performance
- model explainability
- model robustness



## allergy $\Leftrightarrow$ microbiome

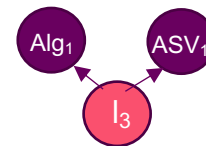
**Network analysis:**

● - latent variables    ● - observed variables



**Conclusion based on:**

- allergy-taxon associations
- presence of latent variables
- Robust PCA



causal

regression

associations