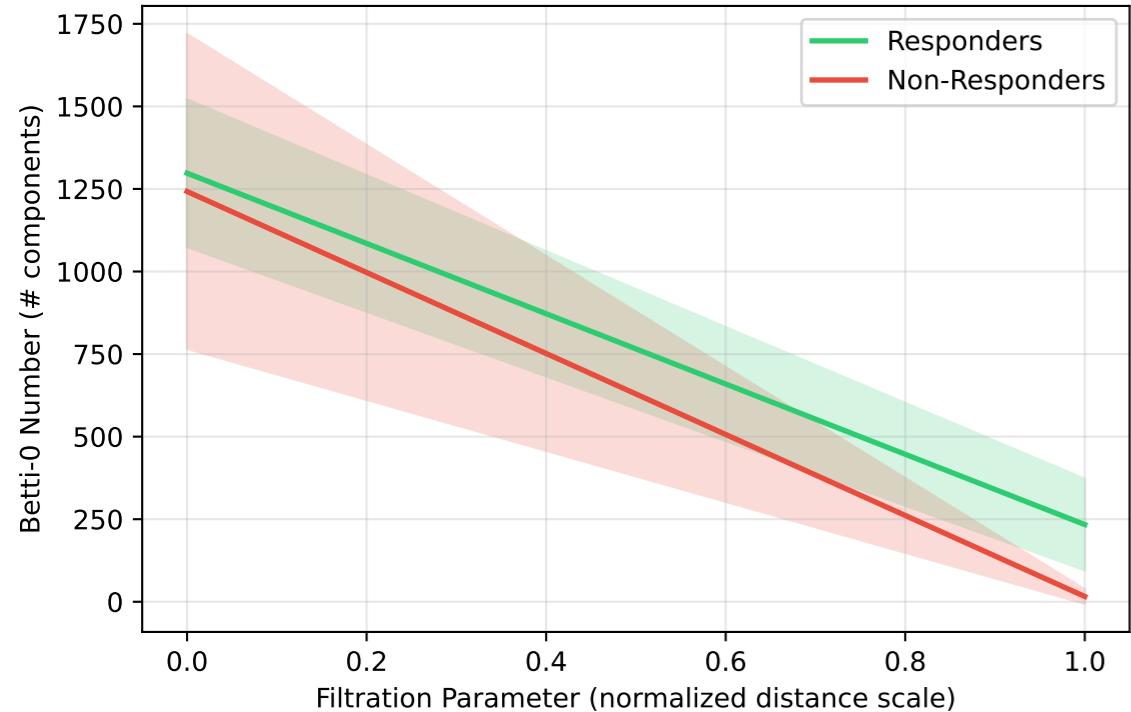
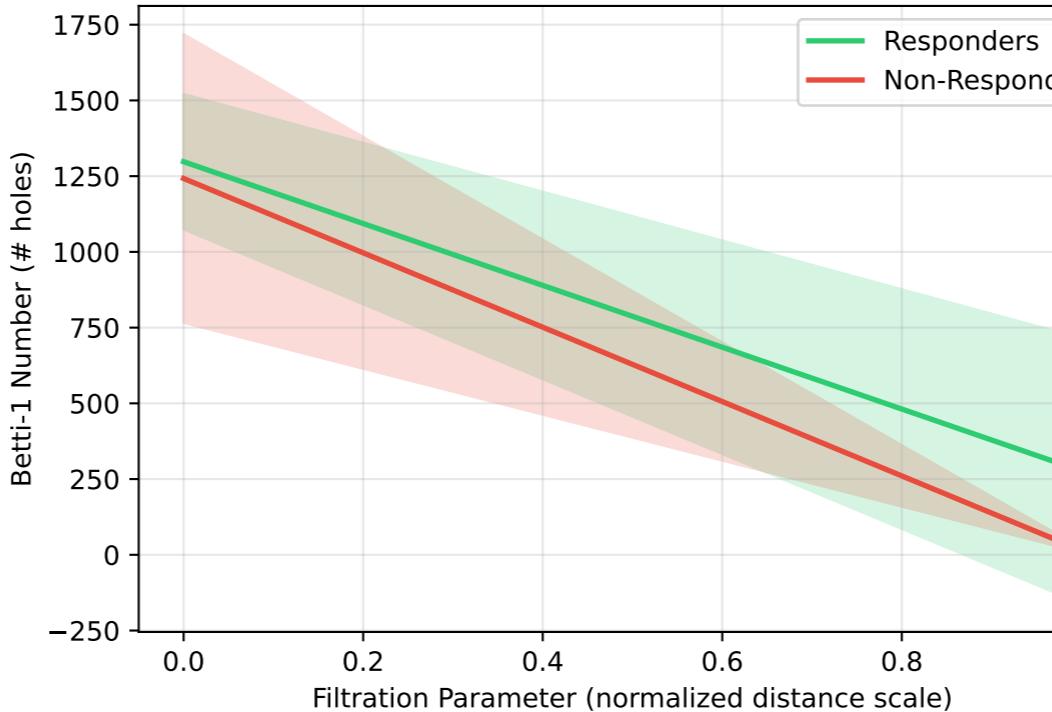


# Topological Data Analysis: Tissue Architecture Comparison (R vs NR)

**Betti-0 Curve (Connected Components)**  
AUC: R=765.8 vs NR=629.2 (p=0.508)



**Betti-1 Curve (Holes/Voids)**  
AUC: R=787.4 vs NR=628.7 (p=0.532)



## Understanding Betti Curves

### WHAT ARE BETTI CURVES?

Betti curves track topological features as we "grow" connections between cells:

- Betti-0: Counts connected components
  - High early = scattered cells
  - Drops as cells connect into groups
- Betti-1: Counts holes/loops
  - Appears when cells form ring structures
  - More holes = more complex architecture

### HOW TO READ:

- X-axis: "Distance scale" - as it increases, cells farther apart get connected
- Y-axis: Number of topological features
- Shaded area: Standard deviation across samples

### INTERPRETATION:

- R shows MORE components (scattered/diverse)
- R shows MORE holes (complex structures)

Cross-domain insight:  
From algebraic topology - tissue with more holes may have better drug penetration or immune cell access pathways.