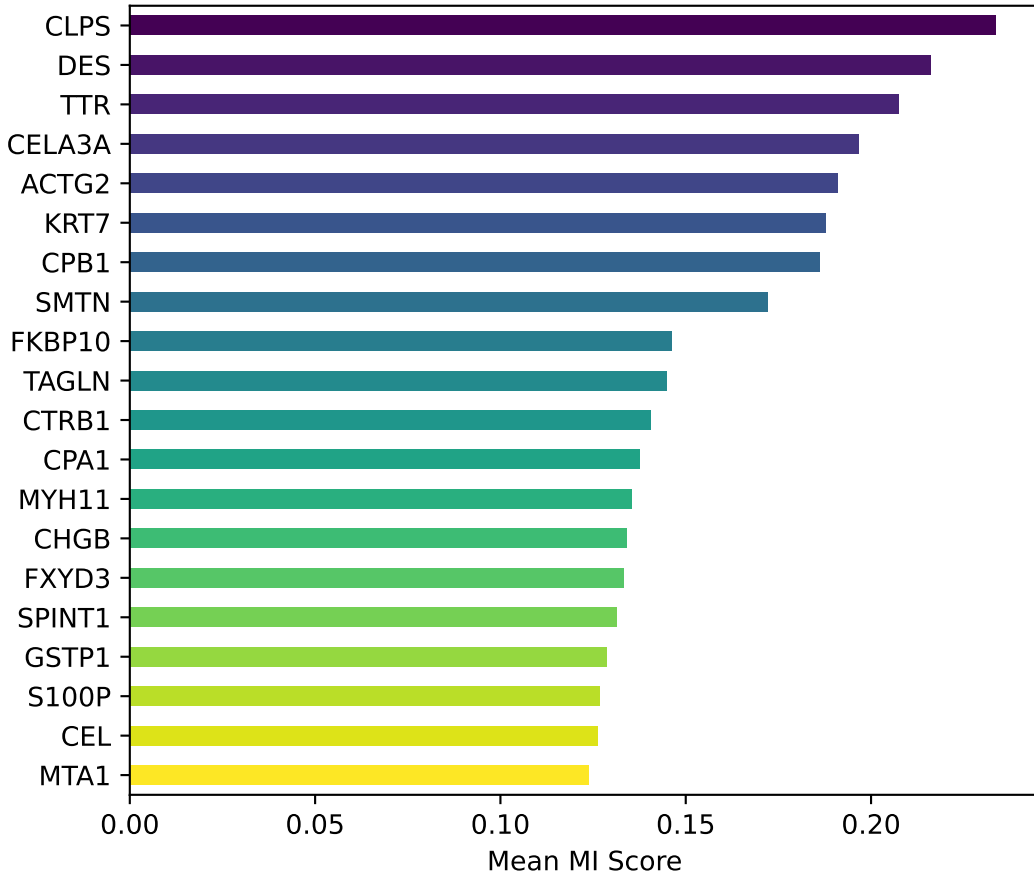
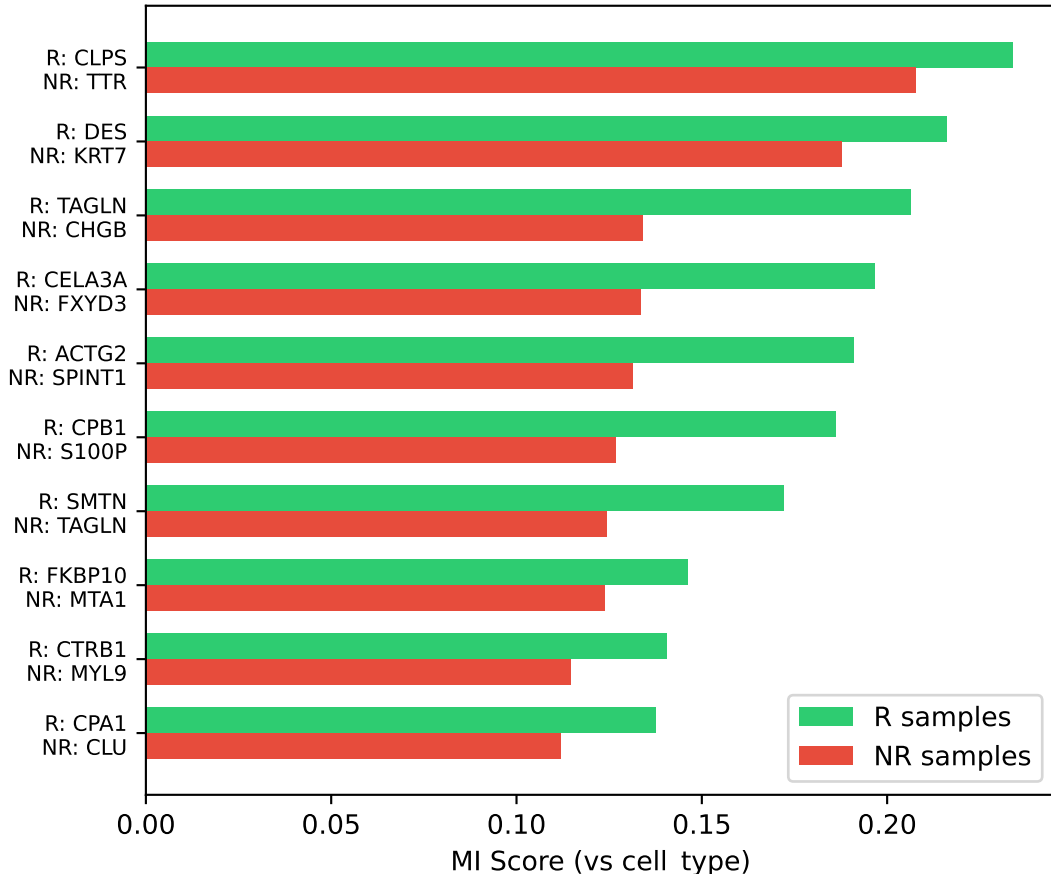


Information-Theoretic Analysis: Cell-Type Markers vs Treatment Response Biomarkers

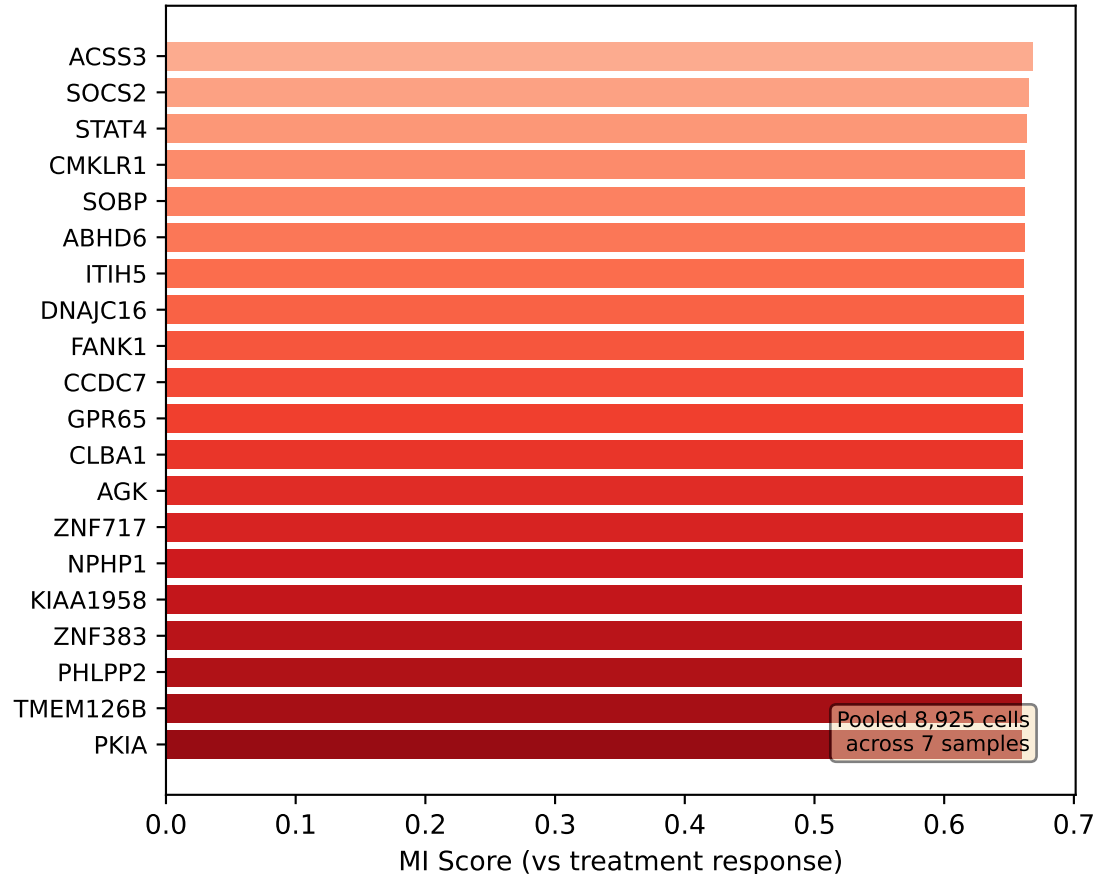
Top 20 Cell-Type Marker Genes (MI vs cell_type, averaged)



Cell-Type Markers Stability Across Response Groups



TRUE Response Biomarkers (MI vs R/NR across all cells)



Understanding MI Analysis

WHAT IS MUTUAL INFORMATION?

MI measures how much knowing one variable reduces uncertainty about another.

- $MI = 0$: Variables are independent
- $MI > 0$: Variables share information
- Higher MI = Stronger association

TWO TYPES OF MI ANALYSIS:

1. MI vs CELL TYPE (Panels 1-2):
"Which genes best distinguish cell types?"
→ Useful for marker identification
→ Applied per-sample
2. MI vs RESPONSE (Panel 3):
"Which genes predict R vs NR?"
→ TRUE treatment biomarkers
→ Computed across all samples pooled

KEY DIFFERENCE:

Panel 1-2: Same gene can be "top marker" in both R and NR - it just identifies cell types well regardless of response.

Panel 3: These genes specifically differ between responders and non-responders.

TOP BIOMARKER CANDIDATES:

- ACSS3: $MI=0.668$
- SOCS2: $MI=0.665$
- STAT4: $MI=0.664$
- CMKLR1: $MI=0.662$
- SOBP: $MI=0.662$