## Asymmetric non-monotonicity (C) Cond. ComBat (D) Causal ComBat (A) Raw (B) Signal I. High Overlap I. High Overlap I. High Overlap I. High Overlap Moderate Overlap II. Moderate Overlap II. Moderate Overlap II. Moderate Overlap Outcome Outcome Outcome Outcome III. Limited Overlap III. Limited Overlap III. Limited Overlap III. Limited Overlap 0 0 Covariate Batch **Expected Signal Batch Effect** Residual Signal Disparity - Linear Model Fit