causl & survivl R packages

Casual Causal September 4

Chase Mathis

September 3, 2025

Problems causl and survivl solve

- Reducing the amount of code you write when running simulations.
- Ability to simulate directly from the marginal distribution, avoiding g-null paradox and lack of clarity in output of g-formula.

g-null paradox

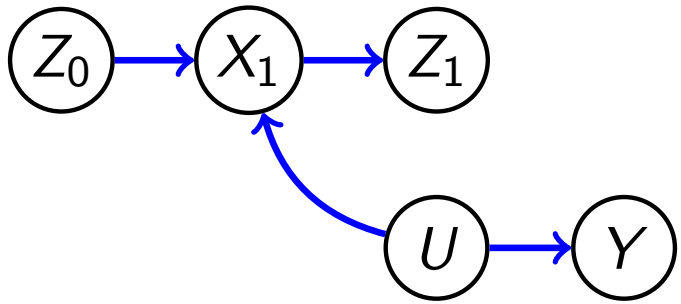

Figure: Classic g-null paradox example (Robins and Wasserman, 1997)

- Assume sharp-null meaning $Z_0 \not\to Y$ and $Z_1 \not\to Y$.
- G-null paradox says g-formula estimator will always reject null as $n \to \infty$.

Specifying marginals instead of conditionals

- It is easy to simulate from $p(Z_0, X_1, Z_1, U, Y)$.
- Simulate
  $Z_0 \sim P(Z_0); U \sim P(U); X_1 \mid Z_0, U \sim P(X_1 \mid Z_0, U) \ldots$

Instead, can you directly specify:

- Marginal potential outcome distribution: $P\left(Y(Z_0, Z_1)\right)$
- Distribution of covariates and treatments $P(U, X_1, Z_0, Z_1)$
- A dependence between the outcome Y and covariates X_1, U conditional on treatments (Z_0, Z_1).

References

James M. Robins and Larry Wasserman. Estimation of effects of sequential treatments by reparameterizing directed acyclic graphs. In *Proceedings of the Thirteenth Conference on Uncertainty in Artificial Intelligence (UAI-97)*, pages 409–420, Providence, Rhode Island, 1997. Morgan Kaufmann Publishers Inc.