


1 - Framing

Population

Patients with sepsis in the ICU

 **Intervention** ($A=1$)
albumin + crystalloids

 **Comparator** ($A=0$)
crystalloids



Outcome

$Y = 28\text{-day mortality}$



Time treatment
within first 6, 24 or 72 hours

2 - Identification

Confounders

- Comorbidities
- Drugs
- Measurements
- Demographics
- Social variables

Other bias

Immortal time bias (24h observed)

3 - Estimation

Feature extraction

Aggregation of confounders:

- First measure
- Last measure
- Median of measures

Causal estimator

- Propensity matching
- Inverse propensity weighting
- Outcome model (T-learner)
- Double Machine Learning
- Doubly robust (AIPW)

Nuisance estimator

- Random forest
- Logistic regression

4 - Vibration Analysis

All analysis steps matter.

Ordered by introduction of bias:

- model selection
- confounder choice
- immortal time bias

5 - CATE

Treatment effect in subgroups.

Heterogeneity estimated for:

- Age
- Septic shock
- Sex