

## HW1

1. Please read related materials to understand the definition of blinding (also referred as masking) and describe the importance of blinding in the randomized experiment from the perspective of causal inference.
2. Suppose that we have the data below on physical condition (good:  $L = 2$ . so-so:  $L = 1$ . bad:  $L = 0$ ), treatment (medication given:  $A = 1$ . medication not given:  $A = 0$ ) and whether patients would die within five years (dead:  $Y = 1$ . alive:  $Y = 0$ ). Assuming that patients taking the medication or not are exchangeable conditional on their physical conditions, estimate the average causal effect  $P(Y^{a=1} = 1) - P(Y^{a=0} = 1)$  and interpret the results.

n	$L$	$A$	$Y^{a=1}$	$Y^{a=0}$
20	2	1	15 dead, 5 alive	?
10	1	1	6 dead, 4 alive	?
10	0	1	5 dead, 5 alive	?
10	2	0	?	9 dead, 1 alive
30	1	0	?	25 dead, 5 alive
15	0	0	?	10 dead, 5 alive

3. In a randomized study the treatment  $A$  is independent of  $PO Y^{a=0}$  and  $Y^{a=1}$ , where 0 denotes the placebo and 1 denotes the active treatment, but  $A$  is not independent of  $Y^{obs}$ . Explain.
4. Please explain the IP weighting method in your own language and think that which weighting method would be most suitable, given the fact that the estimated causal effect may vary depending on different weights.
5. For DAG 2, please write down blocked paths and unblocked paths from  $W$  to  $Y$  and consider which variables should we condition upon in order to make  $W$  and  $Y$  conditionally independent?

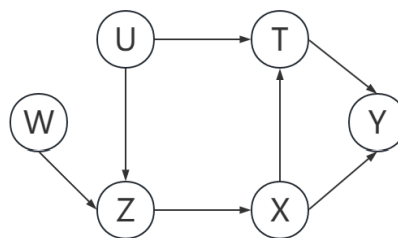


Figure 1: DAG 2