Question 4

Finger Exercises due Sep 18, 2024 07:30 CST Completed

4.1

1/1 point (graded)

True or False? The fundamental problem of causal inference is that it is not possible to observe the potential outcomes $\{Y_{0i}, Y_{1j}\}$ for unit i and unit j.

- ○ True
- ◉ False ✔

Explanation

The fundamental problem of causal inference is that it is not possible to observe both potential outcomes for the same unit i. We only ever observe one of the two potential outcomes for each unit. Which one we observe depends on the action X_i that individual i experiences: $Y_i = Y_{1i}X_i + Y_{0i}(1 - X_i)$. So while for two different units i and j we can observe both potential outcomes $\{Y_{0,i}, Y_{1,i}\}$, we can never observe $\{Y_{0,i}, Y_{1,i}\}$.

Submit You have used 1 of 1 attempt

Answers are displayed within the problem

4.2

1/1 point (graded)

Suppose we want to know the effect of temperature on water. What assumptions do we need to make a causal inference on the effect of temperature on the state of the water in a single glass? Select all that apply.

- ☑ Temporal stability
- ☐ Unit homogeneity
- ☐ Random distribution of water molecule
- ☑ Reversibility (causal transience) ✔

Explanation

If the causal effect of X on Y is temporally stable and reversible, we can observe Y1i − Y0i by repeatedly changing X from 0 to 1. Water transforming from ice to steam and back is an example while treatment for high cholesterol for patient i is a counter-example. Note that temporal stability and causal transience cannot be tested, and these assumptions may not always be plausible.

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Answers are displayed within the problem

4.3

1/1 point (graded)

Suppose we want to know the effect of temperature on water. What assumptions do we need to make a causal inference on the effect of temperature on the state of the water in two different glasses. Imagine that the water in one glass transforms to ice and the water in the other glass transforms to steam. Select all that apply.

- ☐ Temporal stability
- ☐ Unit homogeneity ✔
- ☐ Random distribution of water molecule
- ☐ Reversibility (causal transience)

Explanation

If Y_{1i} and Y_{0i} are identical for all i (i.e., Y_{1i} = Y1 and Y_{0i} = Y0 for all i), we can simply take the difference $Y_{1i} - Y_{0j}$ for i ≠ j to measure the causal effect. The homogeneity of water molecules is an example while treatment for high cholesterol for patient i is a counter-example. Note that this assumption is only plausible under certain laboratory conditions.

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Q 4.2

Hi, for Q 4.2 could we prove causality by only assuming Temporal stability? as in we can free the water from T0 to T1 and observe the difference.

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