Assumptions for Causal Inference

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Example

Suppose we have estimated the joint density $p(a,t)$ of the altitude A and the average annual temperature T of a sample of cities in some country (see Figure 4.6 on page 65). Consider the following ways of expressing $p(a,t)$:

$$\begin{aligned} p(a,t) &= p(a|t)\ p(t) \\ &= p(t|a)\ p(a) \end{aligned} \tag{2.1}$$

How to decide which of the two structures is the causal one?

Example

- Effect of interventions
- Independence of cause and mechanism
- Independent noises

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Principle

Principle 2.1 (Independent mechanisms) *The causal generative process of a system's variables is composed of autonomous modules that do not inform or influence each other.*

In the probabilistic case, this means that the conditional distribution of each variable given its causes (i.e., its mechanism) does not inform or influence the other conditional distributions. In case we have only two variables, this reduces to an independence between the cause distribution and the mechanism producing the effect distribution.

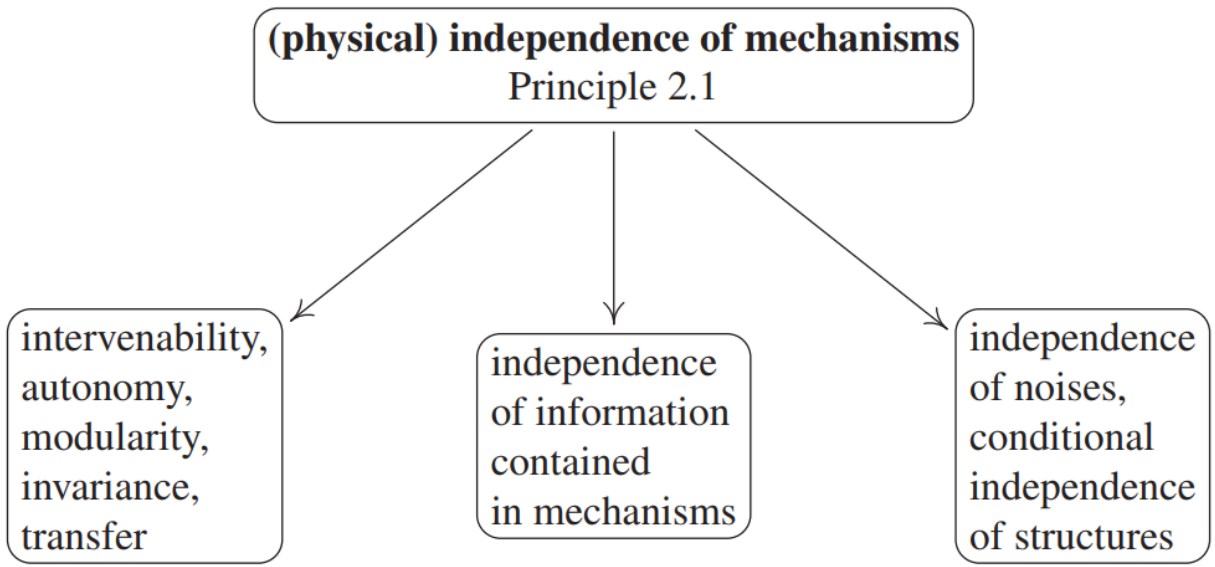

Figure 2.2: The principle of independent mechanisms and its implications for causal inference (Principle 2.1).