🌻 Robustness – How robust is the evidence for that X influences Y ?

How robust is the network of evidence for the influence of one or more "driver" factors on another set of "outcome" factors?

> From (Powell et al. 2024)

We prefer to talk about possible arguments here because this sidesteps the (also interesting) question of whether any individual source made any such argument in its entirety, with all its constituent links. In many circumstances, evidence for a causal path derived from different sources and contexts can be considered to strengthen the argument, whereas heaps of evidence from the same source will not. To address this kind of issue directly, we can use a complementary measure ‘source thread count’ as a measure of the strength of the argument from C to E: the number of sources, each of which mentions any complete path from C to E.

> From (Powell et al. 2024)

Figure 3. An illustrative example of a very simple causal map.

Even with a simple example like this, we can answer many questions by visually examining the paths. But analysis of larger data sets might be simplified by selecting only all the paths between a selected cause and consequence to produce what Bougon et al (Bougon et al. 1977) called an ‘etiograph’. Eden et al. (1992) go so far as to collapse some causal paths into individual links, simply removing intervening factors.

Our causal map software uses the ‘maximum flow/minimum cut’ algorithm (Erickson 2019), which quantifies the robustness of longer paths from C to E by calculating the minimum number of causal claims, which would have to be invalidated or lost to remove any possible causal pathway between them. This is simply the idea that the strength of an argument is dependent on the strength of its weakest link, extended to apply to an interconnected network rather than a single chain. In other words, we can express a path through a causal map as a possible argument: An argument can be constructed that C causally influences D, and then E. This also provides ways to formally address questions such as ‘how robust is the evidence for the influence of C on E, compared to evidence for the influence of B on E?’. As our causal evidence will often be of varying quality and reliability, we are advised to also construct and compare paths that consist only of evidence from the most reliable sources.

Related

- chapter intro
- Formatting your map (recipe)

References

Bougon, Weick, & Binkhorst (1977). *Cognition in Organizations: An Analysis of the Utrecht Jazz Orchestra*. JSTOR.

Eden, Ackermann, & Cropper (1992). *The Analysis of Cause Maps*. https://onlinelibrary.wiley.com/doi/10.1111/j.1467-6486.1992.tb00667.x.

Erickson (2019). *Maximum Flows and Minimum Cuts*. In *Algorithms*.

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