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Identifying Causal Direction in the Two-Variable Case

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Abstract: One of the key characteristics of human cognition is the ability to learn causal structure from data. An influential thread of research into causal learning relies on causal graphical models as a theoretical foundation, and emphasizes the role of prior knowledge, interventions, and statistical independence as tools with which people learn causal structure. What if these sources of information are all absent, as in the problem of identifying causal direction from observations of just two variables? Most work has either ignored this problem or asserted that it is inherently unsolvable. However, recent machine learning algorithms can sometimes infer causal directionality in this setting, by exploiting simple assumptions about the relationship between causes and the noise observed in their effects (Mooij, et al 2016). We investigate whether humans are able to exploit these assumptions or others in order to infer the causal connection between two statistically dependent variables.