

Interdefining Causation and Intervention

(To be presented in the philosophy of science section of SOPHA09)

[anonymized]

Short Abstract

Non-reductive interventionist theories of causation and methodologies of causal reasoning embedded in that theoretical framework have become increasingly popular in recent years. This paper argues that one variant of an interventionist account of causation, *viz.* the one presented, for example, in (Woodward 2003), is unsuited as theoretical fundament of interventionist methodologies of causal reasoning, because it renders corresponding methodologies incapable of uncovering a causal structure in a finite number of steps. This finding runs counter to Woodward's own assessment and to other recent studies which presume that non-reductive interventionism is effectively applicable to uncover causal structures, e.g. (Campbell 2007) or (Shapiro and Sober 2007).

Extended Abstract

Non-reductive interventionist theories of causation and methodologies of causal reasoning embedded in that theoretical framework have become increasingly popular in recent years. The by far most thorough and elaborate presentation of a modern variant of interventionism has been given in (Woodward 2003). As is well known, Woodward conceives of causation and intervention as two *interdefined* concepts. As suggested in (Woodward 2003, 104–107), the particular conceptual interdependence of causation and intervention advocated by non-reductive interventionism is not viciously circular. Moreover, the conceptual core of Woodward's theory can be shown to have some very specific, indeed, rather strong implications, and thus is far from being empty. That is, even though Woodward interdefines causation and intervention, his analysis can be argued to be informative.

Merely shedding light on the conceptual interdependence of causation and intervention, however, is not Woodward's main aim. Rather, he claims that his "primary focus is *methodological*" (Woodward 2008, 194). More specifically, he intends his theory to illuminate "how we think about, learn about, and reason with various causal notions" (Woodward 2008, 194). Woodward takes the interventionist framework to provide the means to experimentally uncover causal structures that involve variables whose values are actually manipulable or to test corresponding causal claims. Several authors have followed Woodward in judging that an interventionist analysis is effectively applicable in experimental contexts (e.g. Shapiro and Sober 2007 or Campbell 2007). According to such studies, the fact that Woodward's theory interdefines causation and intervention in an informative way and, thus, can be said to be *conceptually unproblematic* entails that applying interventionism to uncover causal structures is methodologically or *epistemically unproblematic* as well.

The paper at hand takes issue with this claim. Its main goal is to show that the interdefined conceptual fundament of interventionism, notwithstanding the fact that it is conceptually informative, gives rise to a severe *epistemic* problem when it is resorted to in the course of causal discovery. For applying the conceptual core of Woodward's theory to concrete causal processes in experimental contexts triggers infinite regresses that render it impossible, in principle, to determine of even two concrete variables whether they are causally connected or not in a finite number of steps. Hence, this paper is going to argue that interventionism is not effectively applicable to solve problems of causal discovery. As we shall see, this finding does not generally call into question the power and effectiveness of interventionist methodologies of causal reasoning as, for example, presented in (Spirtes, Glymour, and Scheines 2000) or (Pearl 2000), which often clearly outperform alternative methodologies. Rather, the epistemic regresses triggered by an application of Woodward's analysis in experimental contexts demonstrate that efficient interventionist methodologies cannot and must not be based on the interdefined conceptual core of Woodward's theory. At least two alternative conceptual foundations of interventionist methodologies remain possible: Either causation is introduced as a primitive notion, or causation is spelled out in non-interventionist terms, say in probabilistic or regularity theoretic terms. Intervening on causal structures is one of the most effective ways to uncover these structures. For this very reason, however, the itself causally loaded notion of intervention is unsuited as definiens of causation in the context of causal discovery.

References

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