Counterfactual logic over teams

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Causal team semantics, developed in collaboration with G. Sandu as a common extension of Hodges' team semantics ([4], [8]) and of structural equation modeling ([5], [7]), provides a semantical framework for interventionist counterfactuals ([2], [3], [1]) and other logical operators. In this talk we consider some of the properties of logical languages endowed with causal team semantics; we restrict attention to causal teams that are parametric (i.e. every counterfactual receives a truth value) and recursive (i.e. the causal links between variables form an acyclic graph).

Our variant of the interventionist counterfactual acts on sets of assignments instead of single assignments; as a consequence, some properties of logical systems based on our semantics diverge from those they attain in the setting that is traditionally considered in the literature on causation, the most evident point being the failure of some forms of the law of the excluded middle and their conditional variants. We also use the the causal team setting in order to analyze some properties that have been considered in the tradition on counterfactuals (see [6]); for example, we isolate sufficient conditions that make importation, exportation and permutation laws hold. We provide an "overwriting" rule that takes care of the situations in which the sufficient condition does not hold. We then consider some inference rules that correlate the counterfactuals with other forms of implication and dependence. In particular, we point out that the counterfactuals do not commute with a form of implication which represents the act of accounting for observations.

Finally, we show how some of the deduction systems introduced by Galles&Pearl ([2]) and Halpern ([3]) can be translated into our logical systems and their completeness proofs extended to more general languages.

References

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