An interventional approach to mediation analysis

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Given a causal DAG, Ilya Shpitser has provided a sound and complete algorithm for identification of mediated and path specific effects from observational data under a nonparametric structural equation model with independent errors (NPSEM-IE) . However such effects are not interventional effects. That is, unlike interventional effects, in principle, no randomized experiment applied to variables on the DAG can, even in principle, confirm the identified values, even in the large sample limit. However, we show that any mediated and path specific effect identified under an NPSEM-IE model can be formally obtained as an identified intervention effect (from the same observational data) corresponding to variables on an expanded graph that has a deterministic relationship with the original DAG. Thus the correctness of the identification the identification formula could, in principle, be checked by a randomized experiment if and when a randomized trial intervening on the variables on the expanded graph can be conducted.

This is joint work with Thomas Richardson.

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