Review of: "Causality in Machine Learning: Innovating Model Generalization through Inference of Causal Relationships from Observational Data"

Olivier Côté[1]

1 Université Laval

Potential competing interests: No potential competing interests to declare.

It does a great job at explaining why causal inference is important***in general*** for Machine Learning. The main shortcoming of the article is the lack of details on the result part. As the result part is a pretty important chunk of any article, it is an important shortcoming. Any scientist willing to rely on your research would like to have specific details about your discoveries and their associated shortcomings.

Various notes :

- Page 3 :
  - Why specifically does “current techniques remain vulnerable to learning spurious causality”? and how do you really think we can be 100% bulletproof on this issue? I believe this vulnerability will always remain.
  - "Performance declines sharply on datasets with more than a few thousands samples”. I am not an expert on the specific methods you mention, but do performance really drop with more data?
- Page 4 : I am unsure of the formulation “Causal mechanisms generate the data separately from the learning algorithm”. I believe that you meant that “Direction and broad shape of causal mechanism are determined a-priori, through expert opinion”.
- Page 5 :
  - I really like that you used 10-15 datasets. But how is anybody supposed to be convinced about your “Results and Discussion” part if you do not share any detail on your work? With the level of detail that you give, we hardly have any proof that you did any analysis.
  - Table 1 is uninformative, we do not know which dataset it is and what you do with it (except through the algorithms you mention, which probably have many required tuning).
- Page 7 :
  - “Improved extrapolation” : You should mention that causal inference enables counterfactual thinking to extrapolate.
  - “Transfer learning” : I don't believe that the problem is perfectly solved with causal inference. Causal relationships can still be domain-specific and evolve over time.

- “Reinforcement Learning” : “Our results support…” Again, as the result part is frail, it is impossible to see the relation between your statement about reinforcement learning and your results.

- Page 8 : “This pioneering study illuminated…” I do not feel illuminated.