

Principles of Knowledge Representation and Reasoning

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Exercise Sheet 12

Due: July 19th, 2018

Exercise 12.1 (But-For Causality)

Classical Trolley Problem

You see a runaway trolley moving toward five tied-up (or otherwise incapacitated) people lying on the tracks. You are standing next to a lever that controls a switch. If you pull the lever, the trolley will be redirected onto a side track and the five people on the main track will be saved. However, there is a single person lying on the side track. You have two choices: (1) Do nothing and allow the trolley to kill the five people on the main track. (2) Pull the lever, diverting the trolley onto the side track where it will kill one person.

Footbridge Trolley Problem

As before, a trolley is hurtling down a track towards five people. You are on a bridge under which it will pass, and you can stop it by putting something very heavy in front of it. As it happens, there is a very heavy man next to you – your only way to stop the trolley is to push him over the bridge and onto the track, killing him to save five.

- (a) Represent these situations in two separate causal models.
- (b) Check if the death of the one person in the Classical Trolley Problem is a but-for cause for the survival of the five persons (in case you pull the lever).
- (c) Check if the death of the one person in the Footbridge Trolley Problem is a but-for cause for the survival of the five persons (in case you pull the lever).
- (d) If you got different results: Do you think this difference is morally relevant?

Exercise 12.2 (HP Definitions of Causality)

Voting Scenario I

There are 3 people voting for either Billy or Suzy. Suzy wins 2:1.

Voting Scenario II

There are 3 people voting for either Billy or Suzy. Suzy wins 3:0.

- (a) Represent these situations in a causal model.

- (b) Check to what extent the original HP definition, the updated HP definition, and the modified definition agree or disagree with respect to which people caused Suzy's winning in each of the two scenarios.

Exercise 12.3 (Normality)

Consider the situation that an Assassin puts poison in a Victim's coffee and the Victim's Bodyguard puts an antidote in the coffee such that the Victim survives. However, the Assassin would not have put the poison in the coffee if the Bodyguard hadn't put antidote in it in the first place.

- (a) Represent the situation as a causal model.
- (b) First check that the Bodyguard putting the antidote in the coffee is a cause for the Victim's survival according to the modified HP definition.
- (c) Extend your causal model with a normality relation, and show that now the unintuitive result from (b) does not hold anymore.