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Note Title 2016-01-12

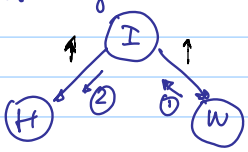
Some examples of plausible reasoning ("reasoning under uncertainty")

Icy roads example. Smith, Dr Watson, Mr Holmes

Three variables with states yes, no;
I, icy roads; W, Watson crashes;
H, Holmes crashes.

We assume that each variable/state pair has an associated certainty, which is a number.

I has the effect of increasing the certainty of both W and H.
We can summarize the model used by Inspector Smith in this diagram:



(A)→(B) is read "A may cause B"
The arrows indicate "causal impact"

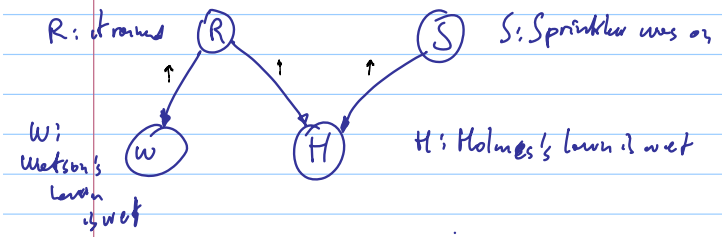
The small up-arrows indicate that the direction of the impact on certainty. (E.g., higher certainty in I results in higher certainty in W.) (Both arrows have positive impact.)

When the secretary reports that Dr. Watson has crashed, Inspector Smith reasons in the evidential direction (from effect to (possible) cause, against the arrow). Then the inspector reasons in the causal direction and increases his certainty that Holmes has crashed too.

When the secretary tells inspector Smith that the roads are not icy, the dependence between W and H is broken.
Dependence of A and B means that a change in the certainty of A (viz. B) changes the certainty in B (viz. A).
H and W are dependent, but they are conditionally independent given I.

Note that Smith's certainty in H has changed, b/c now Smith is certain that the roads are noticy.

Example 2: Wet Grass



Intercausal reasoning occurs when the certainty in W

increases. The kind of inter caused reasoning that occurs here is called explaining away; in the example, establishing (with high certainty) that it rained, lowers the certainty of the competing possible cause that the sprinkler was on.