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

I. Bayes example. Smith, Ron Watson, Mr Holmes

Three variables will suffice; yes, no;
I, I, I, yes, no; W, Watson crashes;
H, Holmes crashes.

We assume that each variable/state pair has
an assigned 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 inspecting
Smith in this diagram:

\[ I \rightarrow W \rightarrow H \]

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

When the secretary reports that Dr. Watson has arrested Inspector Small reasons in the evident direction (from effect to possible cause, against the arrow).

Then, the inspector reasons in the reverse direction and increases his certainty that Holmes has cracked the case.

When the secretary tells Inspector Small 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 of B (viz. A).

If W and H are dependent, but they are conditionally independent given I.
Note that Smith's certainty has changed.
B/c now Smith is certain that the roads are wet.

Example 2: Wet Grass

R: Farm S: Sprinkler was on

W: Watering

H: Holmes's lawn is wet

Better causal reasoning occurs when the central F is W.
increases. The kind of inferential 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.