A review of a paper in AI.

I read "Default Reasoning as Likelihood Reasoning" by Elaine Rich. (My copy did not reveal where it had been published; the format suggests some conference proceedings. If that impression is correct, I am glad I did not attend the conference in question.)

For someone without much prior exposure to the material in question, the paper is quite revealing as it gives some idea of the stuff so-called "expert systems" are made of. Starting from half-truths and treating them as the whole truth, contradictions are easily reached. I quote:

"Now two conflicting facts are believed (sic) and a conflict resolution mechanism must be applied to choose between them or perhaps to decide that no conclusion is justified. In standard default logic, the only conflict resolution technique available is time sequencing. The first conclusion to be drawn blocks later conflicting ones, regardless of the relative strengths of each of the conclusions." (This quotation is characteristic of the author's style: the "mechanism" in the first sentence has become a "technique" in the second one and — much worse — there is no indication that the third sentence is meant to explain what is meant by "time sequencing" as "conflict resolution technique".) The author is justifiably dissatisfied with "standard default logic" and the goal of her paper is "to show that

1

if default reasoning is treated as likelihood reasoning [...], then natural (sic) solutions emerge for several of the problems that are encountered when default reasoning is used". (A week before I saw this paper I had urged my students to become very suspicious whenever the adjective "natural" is used by way of recommendation.)

By way of introduction of the author's alternative to default reasoning, I quote "We will adopt the likelihood reasoning system used in Mycin. If a proposition is known definitely to be true, then it is held to be true with a certainty factor (CF) of 1. If it is known definitely to be false, it is known with a CF of -1. If there is equal evidence for and against a proposition (including the situation in which there is no evidence either way) then the proposition has an associated CF of 0. A CF in between (read: "A CF between") these values indicates that the evidence either supports or disconfirms (sic) the associated proposition but it does (read "but does" or "but that it does") so with some doubt." (In passing we note that, two columns later, the author shows her own logic to be a bit shaky: from the fact that an assertion has CF=1, she concludes that "the truth of this assertion is certain".)

Closer scrutiny of her rules for associating CF's to "conclusions" cast, however, some doubt

2

on the "naturalness" of her solution. I mention two reasons for that doubt.

(i) "Given an implication $P_1 \wedge P_2 \wedge \ldots \wedge P_n \Rightarrow C$ (CF=k) Then the CF attached to C will be $k \times \Pi \, CF(P_i)$ ".

However, for $n=2$ and arbitrary C, the implication

$$false \wedge false \Rightarrow C \qquad (CF=k)$$

can be given with $k=1$. Since $CF(P_1)$ and $CF(P_2)$ both equal -1, her rule yields for arbitrary proposition C a $CF=1$, i.e. the truth of any assertion is certain.

(ii) She represents
   "Typically Republicans are not pacifists"
   "Typically Quakers are pacifists"
   "Bill is a Republican and a Quaker"

by
   $Republican(x) \Rightarrow \sim pacifist(x)$ $(CF=.8)$
   $Quaker(x) \Rightarrow pacifist(x)$ $(CF=.99)$
   (and, presumably,
   $Republican(Bill) \wedge Quaker(Bill)$ $(CF=1)$).

and continues:
" Now we can assert
   $pacifist(Bill)$ $(CF=.19)$
by simply accepting the more likely belief but modifying its CF to account for the conflicting evidence. We do this by subtracting the CF of the conflicting assertion from the CF of the assertion that is chosen."

The first problem with this rule is that the difference of two CF-values need not lie in the range from -1 to +1. The other problem surfaces when we replace the second fact by

"All Quakers are pacifists"

represented according to the rules by

Quaker (x) $\Rightarrow$ pacifist (x)   (CF=1).

Now I can assert

pacifist (Bill)   (CF=1)

whereas her rule would give for this assertion a CF= ·2   .

In short, we grant her that "standard default logic" is objectionable; her "likelihood reasoning", however, is not noticeably better. The source of the trouble is that she treats the same expressions sometimes as logical expressions, sometimes as half-truths, and expressions that are equivalent in the first sense (such as

person(x) $\Rightarrow$ sees (x)   and

$\sim$ sees (x) $\Rightarrow \sim$ person (x)   )

may get very different CF-values when treated as half-truths. The problem whether the CF-value of $P \vee \sim P$ depends on the CF-value of P is, not even raised.

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The paper is sloppily written. Readers objecting to "either" followed by more than two alternatives or to a sentence starting with "Given this assumption" without anything being assumed in the pre-

ceding sentences should not read this paper. One of the worst sentences is probably "If bird(x) and not fly(x) is not provable, then conclude fly(x)."; my guess is "If bird(x) and [[not fly(x)] is not provable], then conclude fly(x).".

If this paper has, in some sense, been "accepted", its referees have disqualified themselves.

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