

Certainty Factors exercises. MIA & MESIIA

Planning and Approximate Reasoning

1. Apply CF model

Given the following network of inference with the corresponding Certainty Factors of the rules, solve the following case where the evidences are:

Facts: $CF(A) = 0.4$, $CF(B) = 0.9$, $CF(C) = 0.7$ and $CF(D) = 0.8$.

The rules are:

- If (A and B and C) then E ($CF = 0.8$)
- If (C or D) then E ($CF = 0.9$)

Make the calculations and explain the conclusion you reach about the truth of the fact E and the certainty of your conclusion.

If we add a third rule like: If E then G with a negative $CF = -1.0$, what would be the truth of G ?

2. Judge

Peter is judged of murder. The juror's reasoning is:

1. If there are fingerprints on gun or in the place then Guilty ($CF\ 0.75$)
2. If there is a motive then Guilty ($CF\ 0.6$)
3. If defendant has alibi then Guilty ($CF\ -0.8$)

The evidence presented is:

a) CSI expert testifies that the evidence of fingerprints in the gun is 0.5, but the presence of defendant's fingerprints in the place is 0.9.

b) The mother-in-law testifies that the defendant has a motive, but she hates the defendant, so the credibility is not high (0.5)

c) An expert of high prestige provides an excellent alibi for the defendant (0.95)

Verdict for Peter: innocent or guilty?

2. Helping Sherlock Holmes

Mr. Holmes receives a telephone call from his neighbor Dr. Watson stating that he hears a burglar alarm sound from Mr. Holmes' house.

Mr. Holmes prepares to rush home because there is a probability of 0.99 of burglary. **But there is a burglary ???**

Dr. Watson is known to be a tasteless practical joker, so the certainty of the message is 0.5

Mr. Holmes calls his neighbor Mrs. Gibbons and she confirms the alarm sound.

Mrs. Gibbons is far more reliable when she is sober, so the confidence of the message is 0.9.

However Mrs. Gibbons has drinking problems and she is probably drunk. So the confidence on being sober is -0.7.

Consequently: is there a burglary at Holmes' house or not?

3. Virus in my computer

I've had some bad experiences with virus in computers. In fact, I have drawn some rules about it, with different certainty factors:

Rule 1: If there is an anomalous behaviour of the computer then it has virus. CF= 0.8

Rule 2: If I have an updated antivirus then computer has virus. CF=-0.95

Rule 3: If some files couldn't open then this is an anomalous behaviour. F=0.8

Rule 4: If the system works too slowly and there are few programs running, then this is an anomalous behaviour. CF=0.6

Evidences are the following:

Today I just turned up the computer early in the morning (CF few programs = 1.0) and it was quite slow (CF works too slowly = 0.6).

Then I tried to open the file I was working on yesterday but I received an error, but another file worked ok (CF files don't open = 0.8).

I have an antivirus that is updated automatically at night (CF updated antivirus = 1.0).

Question 1: According to the previous facts, observed today, is there a virus in my computer?

Question 2: What happens if I don't rely too much in the antivirus? More precisely, calculate which is the maximum certainty factor for the "updated antivirus" fact that makes the final value of CF for "computer has virus" at least 0.3.