

HW#8

1. Any of the following constraints will yield a $\Pr(D|T) \geq 0.30$.

Constraints (P = positive, N = negative, D = disease, T = test):

- a. Prior probability of having the disease = $\Pr(D = P) \geq 0.008942$
Old value was $\Pr(D = P) = 0.001$
- b. The false positive for the test = $\Pr(T = P | D = N) \leq 0.002219$
Old value was $\Pr(T = P | D = N) = 0.02$

As you can see, the sensitivity analysis said nothing about the false negative of the test, so I am assuming that this value does not affect $\Pr(D|T)$.

2.

- a) The most likely instantiation is as follows:

Battery=OK
DogBarking=No
DogBowelTrouble=Yes
DogOutside=Yes
ExpectingGuests=No
FamilyHome=No
HearableBarking=No
LightSensorHealth=OK
OutdoorLight=On
SoundSensorHealth=OK

I arrived at this answer by first setting LightSensor=On and SoundSensor=Off. Then, I went into Query Mode and opened the MAP dialog. I selected all 10 unassigned variables in the Variable Selection Tool and ran the MAP computation.

- b) The most likely instantiation is as follows:

LightSensor=On
SoundSensor=Off

I arrived at this answer by first setting ExpectingGuests=No and FamilyHome=Yes. Then, I went into Query Mode and opened the MAP dialog. I selected the two variables,

LightSensor and SoundSensor in the Variable Selection Tool and ran the MAP computation.

c) One set for Z could be {Battery, DogBarking}. Including the Battery variable in Z eliminates the path $\text{SoundSensor} \rightarrow \text{Battery} \rightarrow \text{LightSensor}$. Including the DogBarking variable in Z eliminates the only other path from SoundSensor to LightSensor. Thus, the sensors are now d-separated and thus are independent.

d) It is a multiply-connected network because there is at least one pair of nodes with more than one path. There are two paths to get from SoundSensor to LightSensor. Thus, it is a multiply-connected network.