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HW#8

1. Any of the following constraints will yield a Pr(D|T) >= 0.30.

   Constraints (P = positive, N = negative, D = disease, T = test):
   a. Prior probability of having the disease = Pr(D = P) >= 0.008942
      Old value was Pr(D = P) = 0.001

   b. The false positive for the test = Pr(T = P | D = N) <= 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 SoundSensor → Battery → 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.