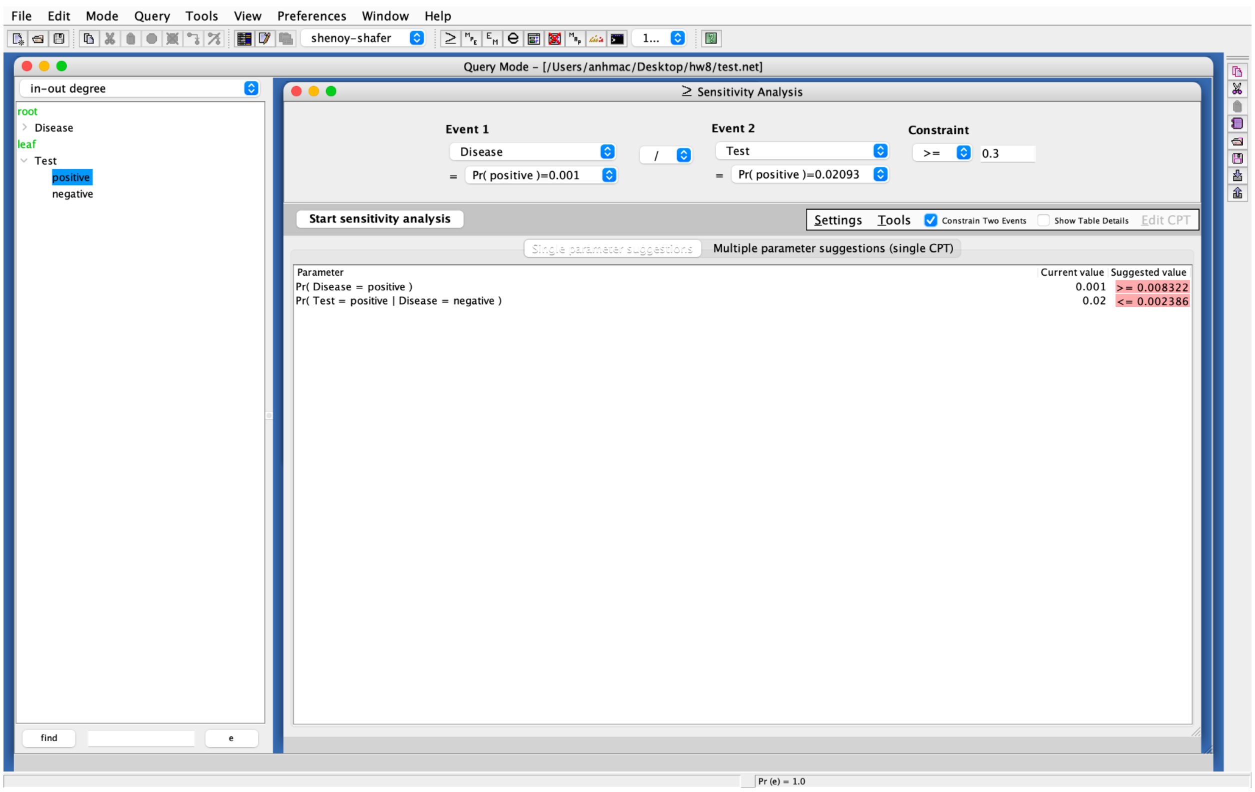
Anh Mac
CS161, Spring 2021

Homework 8

1.

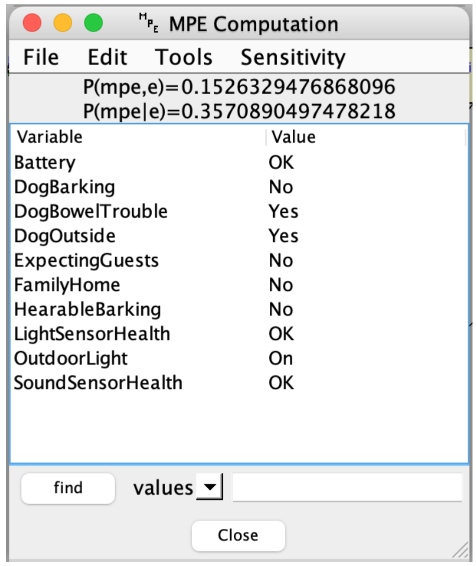


To satisfy the constraint that $Pr(D|T) \geq 0.3$, SamIAm suggested the following conditions:

a. Probability of having the disease: $Pr(D = positive) \geq 0.008322$
b. Probability of false positive test: $Pr(T = positive \mid D = negative) \leq 0.002386$
c. The sensitivity analysis does not suggest anything for probability of false negative test, so changing only $Pr(T = negative | D = positive)$ most likely would not be able to help us satisfy the constraint.

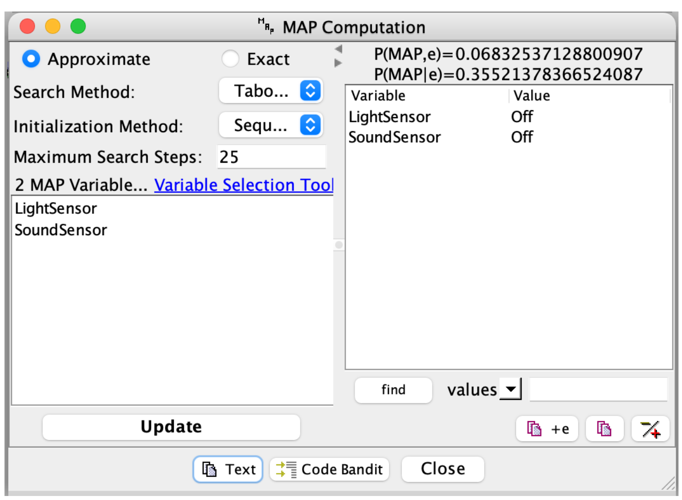
2.

a) The most likely instantiation of all variables given that Sambot has sensed the lights to be on, but has sensed no bark is the following:



To obtain this answer, I first selected SoundSensor = Off and LightSensor = On on the sidebar with the variables listed, then ran the MPE computation to get the results.

b) The most likely instantiation of the sensors given that family is home and no guests are expected is the following:



To obtain this answer, I first selected FamilyHome = Yes and GuestsExpected = No on the sidebar with the variables listed, then I used the Variable Selection Tool to select LightSensor and SoundSensor as MAP variables, and ran the MAP computation to get the results.

c) The smallest set of variables Z such that the two sensors are independent could be { Battery, FamilyHome }. FamilyHome is both a divergent and sequential valve that blocks a path between the two sensors, and Battery is a divergent valve that blocks the other path between these two sensors. Thus, this blocks all paths between the variables, making them d-separated and independent when Z is known.

d) The network we constructed is a multiply-connected network since there is at least one pair of nodes that has more than one path (i.e. LightSensor and SoundSensor).