COM SCI 161A HW 8 Solution

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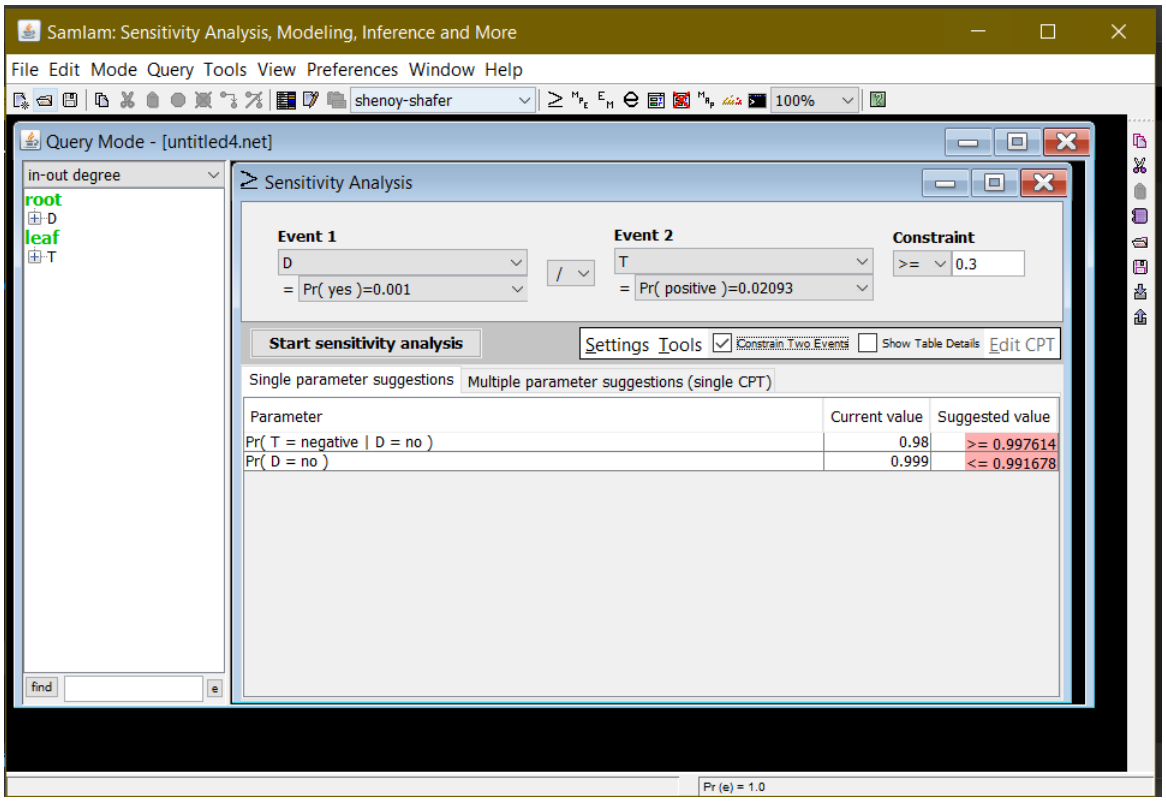
Problem 1. $P(D|T) \geq 0.3$

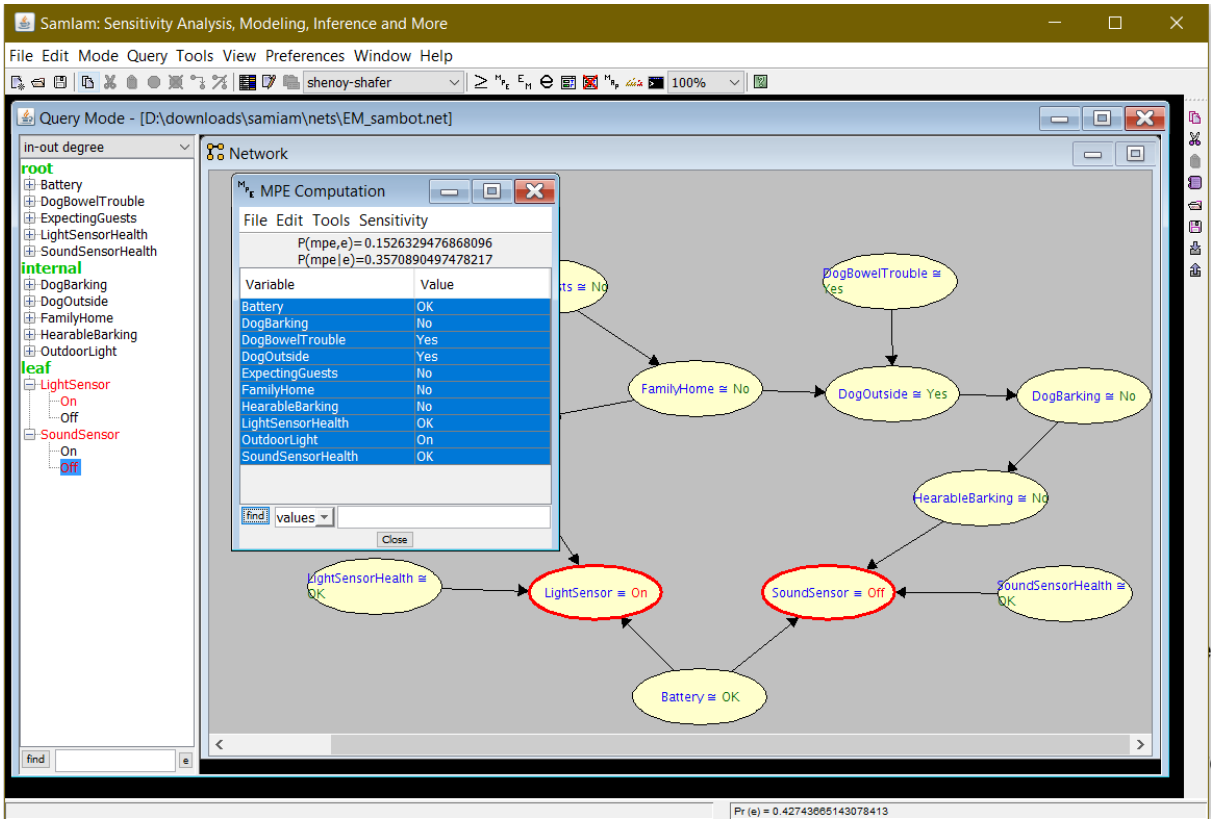
Solution 1. To satisfy the constraint $P(D|T) \geq 0.3$, following conditions are suggested:
i) $P(D = no) \leq 0.991678$ i.e. $P(D = yes) \geq 0.008322$, the prior probability of having a disease should be atleast 0.008322
ii) $P(T = negative|D = no) \geq 0.997614$ i.e. $P(T = positive|D = no) \leq 0.002386$, the false positive rate should be atmost 0.2386%
iii) There is no condition given for the false negative rate, which means changing false negative rate doesn't satisfy our constraint.



Problem 2. Sambot

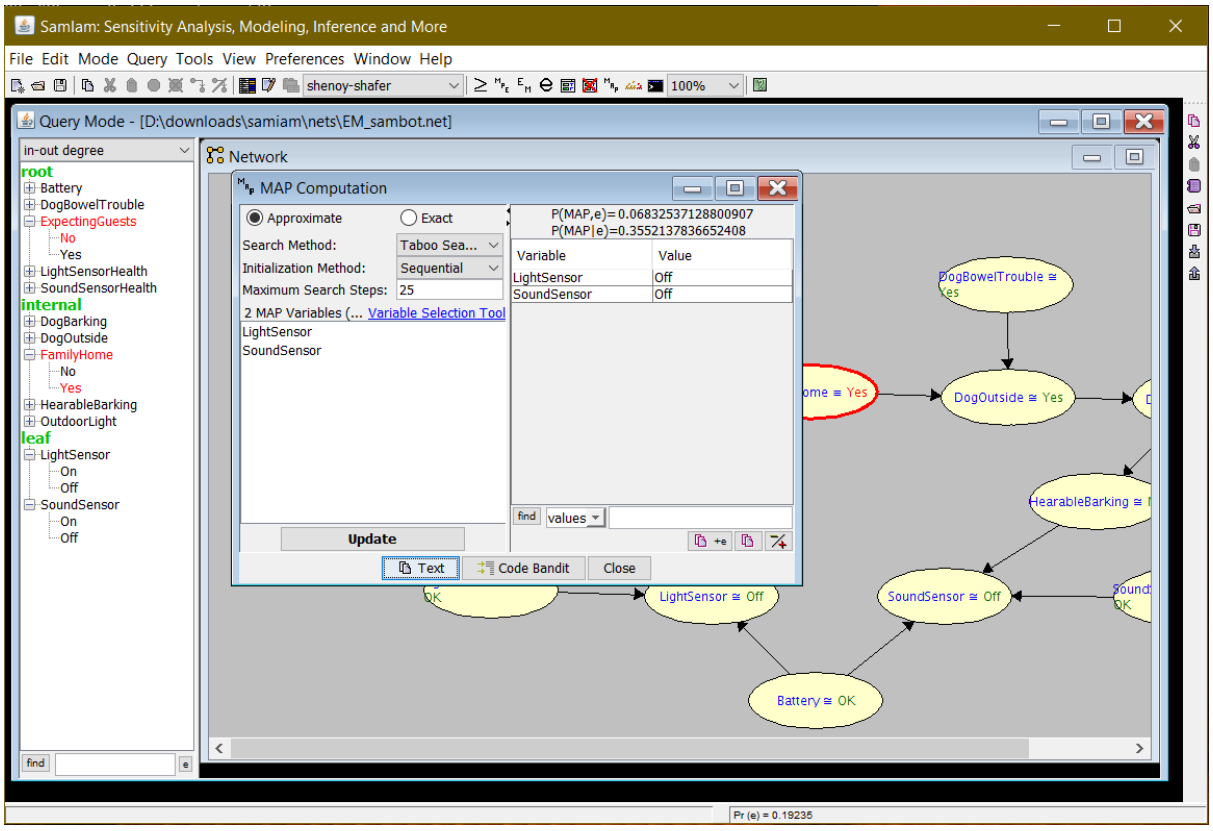
Solution 2a. After doing EM, we set the LightSensor to be "On" and SoundSensor to be "Off" and run MPE to get the most likely explanations for all variables, as follows:

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



Solution 2b. Since we only need to find the most likely instantiations of the sensors, we first set FamilyHome to "Yes" and ExpectingGuests to "No" and run MAP to get following instantiations:

LightSensor	Off
SoundSensor	Off



Solution 2c. Since Battery directly connects the two sensors as a divergent node, it needs to be in Z to close the path. The other path can be close by knowing any of the following: OutdoorLight, FamilyHome, DogOutside, DogBarking or Hearable Barking. So the minimum node in Z has to be 2. One possible Z can be **{Battery, FamilyHome}**.

Solution 2d. The network constructed is **Multiply connected network** as there exists multiple path between nodes.