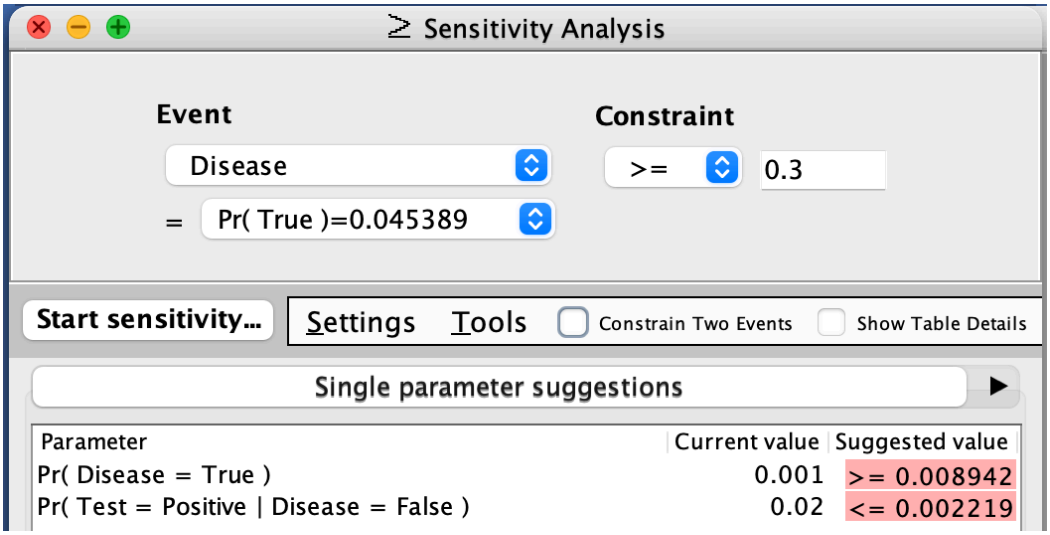
CS 161 | Spring 2024 | Assignment 8

1. Disease and Diagnosis
   - See **test.net.**
   - Conducted sensitivity analysis after fixing Test=Positive. The screenshot captures the single parameter suggestions provided by SAMIAM with input Pr(Disease=True / Test=Positive) >= 0.3.



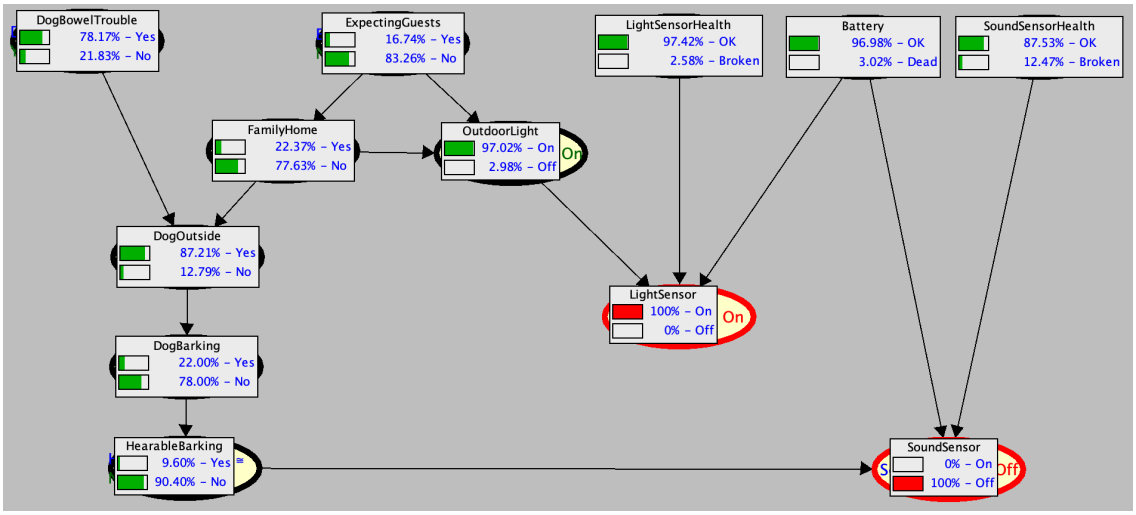
2. Sambot
   (a) Set of variables and their values
      - ExpectingGuests: Yes, No, N/A
      - FamilyHome: Yes, No, N/A
      - SoundSensor: On, Off, N/A
      - LightSensor: On, Off, N/A
      - HearableBarking: Yes, No, N/A
      - Battery: OK, Dead, N/A
      - SoundSensorHealth: OK, Broken, N/A
      - LightSensorHealth: OK, Broken, N/A
      - DogBarking: Yes, No, N/A
      - DogOutside: Yes, No, N/A
      - OutdoorLight: On, Off, N/A
      - DogBowelTrouble: Yes, No, N/A

   (b) Causal structure
      - ExpectingGuests ⇒ FamilyHome
      - ExpectingGuests ⇒ OutdoorLight
      - FamilyHome ⇒ OutdoorLight
      - FamilyHome ⇒ DogOutside
      - SoundSensorHealth ⇒ SoundSensor
      - LightSensorHealth ⇒ LightSensor

- Battery ⇒ SoundSensor
- Battery ⇒ LightSensor
- HearableBarking ⇒ SoundSensor
- DogOutside ⇒ DogBarking
- DogBarking ⇒ HearableBarking
- OutdoorLight ⇒ LightSensor
- DogBowelTrouble ⇒ DogOutside

(c) Learned network

- Setting LightSensor=On and SoundSensor=Off created the resulting network:

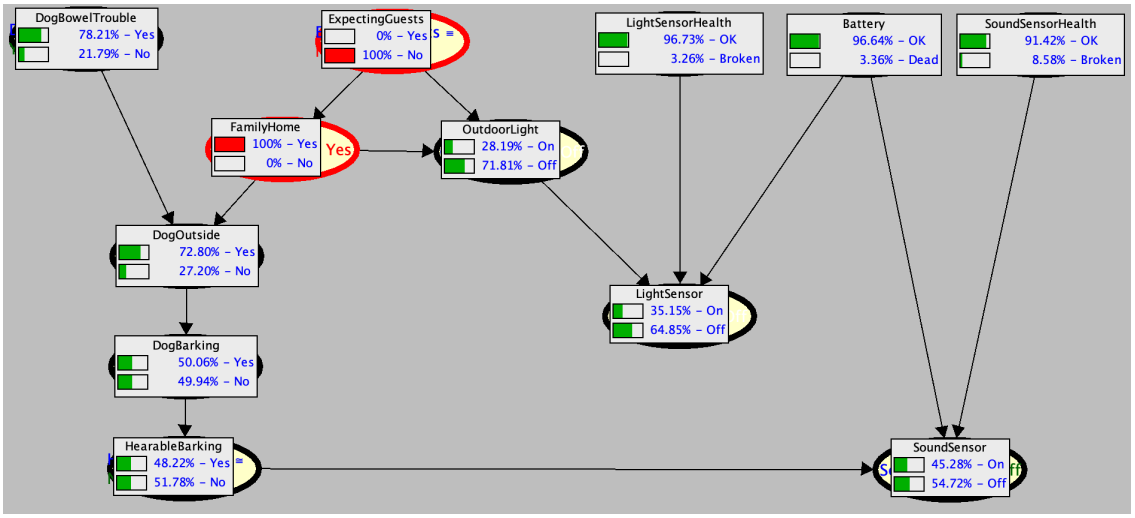


The most likely instantiation of all variables + its probability values after running a MPE computation is below:

P(mpe,e)=0.1526329476868096
P(mpe|e)=0.3570890497478217

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

- Setting FamilyHome=Yes and ExpectingGuests=No created the resulting network:



The most likely instantiation of the sensors + its probability values after running a MPE computation is below:
LightSensor: Off
SoundSensor: Off

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P(mpe,e)=0.03013923205915524
P(mpe|e)=0.1566895350099051
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- Let Z ={Battery, FamilyHome}, then LightSensor and SoundSesnor are independent by the divergence of both variables into the sensors by d-separation.
- The network constructed is a multiply-connected network.