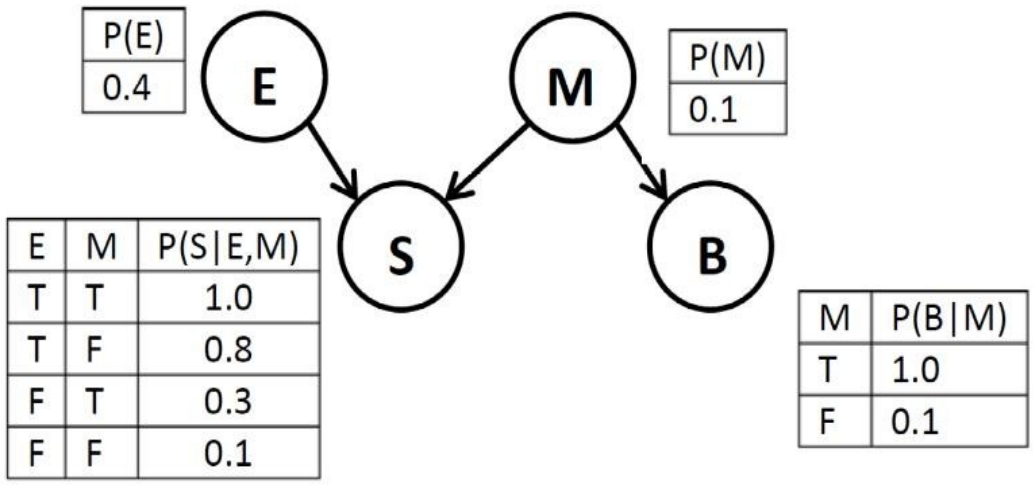
AI COURSE TUTORIALS: September 29, 2021

Instructions: Solve the problems given below using pen and paper. Write your name and roll number clearly on every page. Take a scan or picture and post in chat box

1. A smell of sulphur (S) can be caused either by rotten eggs (E) or as a sign of the doom brought by the Mayan Apocalypse (M). The Mayan Apocalypse also causes the oceans to boil (B).
   The Bayesian network and corresponding conditional probability tables for this situation are shown below.

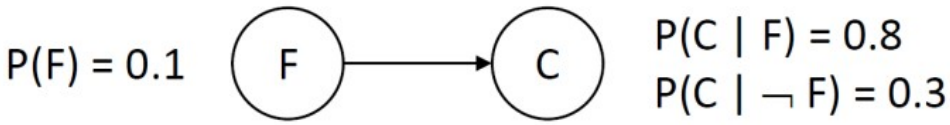


E	M	P(S|E,M)
T	T	1.0
T	F	0.8
F	T	0.3
F	F	0.1

M	P(B|M)
T	1.0
F	0.1

a. Compute P(¬E,¬S,¬M,¬B).
b. What is the probability that the oceans boil?
c. What is the probability that the Mayan Apocalypse is occurring, given that the oceans are boiling?
d. What is the probability that the Mayan Apocalypse is occurring, given that there is a smell of sulphur, the oceans are boiling, and there are rotten eggs?
e. What is the probability that rotten eggs are present, given that the Mayan Apocalypse is occurring?

2. Consider the following Bayesian network, where F = having flu and C =coughing:

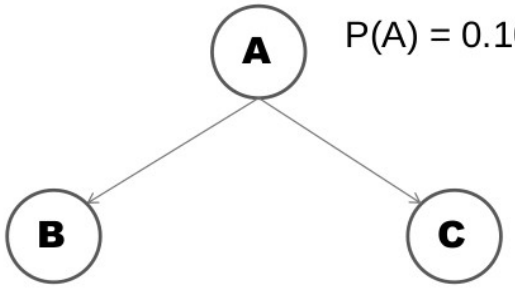


a. Write down the joint probability table specified by the Bayesian network.

b. Are C and F independent in the Bayesian network of Part a?

c. Determine the probabilities for the alongside Bayesian network so that so that it specifies the same joint probabilities as above.

3. Consider the following Bayesian network:

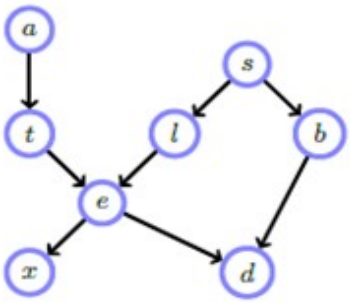


A	P(B)
T	0.85
F	0.04

A	P(C)
T	0.75
F	0.1

Compute P(A | ¬B, C).

4. Examine the following belief network for a Chest Clinic:



x = Positive X-ray
d = Dyspnea (Shortness of breath)
e = Either Tuberculosis or Lung Cancer
t = Tuberculosis
l = Lung Cancer
b = Bronchitis
a = Visited Asia
s = Smoker

The table values are:

P(a) = 0.01 P(s) = 0.5

P(t|a) = 0.05 P(t|¬a) = 0.01

P(l|s) = 0.1 P(l|¬s) = 0.01

P(b|s) = 0.6 P(b|¬s) = 0.3

P(x|e) = 0.98 P(x|¬e) = 0.05

P(d|e,b) = 0.1 P(d|e,¬b) = 0.7

P(d|¬e,b) = 0.8 P(d|¬e,¬b) = 0.1

P(e|t,l) = 0 only if both t and l are false, and 1 otherwise.

Compute P(d).