BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
HYDERABAD CAMPUS
CS F407: Artificial Intelligence

Assignment No: 3   **Total Marks: 20**   **Submission Date: 12.04.2018**

Q.1 AI researchers have developed several **Expert System shells** for the development of Expert systems. These shells are empty Expert System knowledge bases, which have the structure and interface already written for you; all you need to do is to add the knowledge into the KB. Instead of writing an Expert System from scratch, for this problem you will be using a small Expert System shell to design and implement an expert system. You may use PyKnow Framework for building the concerned expert system.

Students with first even ID number in the group (sorted) should build the problem (a), and with first ID as an odd ID number should build the problem number (b).

[8 Marks]

(a) Many rural areas in India have extremely limited access to medical advice. People travel long distances to clinics, or medical facilities and there is a shortage of medical experts in most of these facilities. This results in slow service, and patients end up waiting long hours without receiving any attention. Hence, medical expert systems can play a significant role in such cases where medical experts are not readily available. A Diagnosis Expert System can help a great deal in identifying those diseases and describing methods of treatment to be carried out.

Design a knowledge-base expert system that aims to provide the patients with medical advice and basic knowledge on various diseases. It should consider various symptoms and signs like chest pain, cough, fainting, fatigue, headache, back pain, sunken eyes, low body temperature, restlessness, sore throat, fever etc. along with its severity status and provide the patients with medical advice. You can use www.britannica.com/topic-browse/Health-and-Medicine/Diseases-and-Disorders or and other source to gather expert knowledge about some of the diseases with the given symptoms.

(b) Build an Expert System that can recommend restaurants by asking the user questions about their preferences regarding their characteristics, having at least 5 different restaurants to distinguish among. The Expert System is to make its recommendations based on the features of a restaurant which would be significant to the average customer; these features should include such things as the style of service at the restaurant (sit-down, fast food, buffet), the kind of food served (Vegetarian, Non-vegetarian, etc.), the average cost of a meal (cheap, medium, expensive), and so on. If you can provide expert advice for the restaurants available within BITS, Hyderabad that would be an added advantage.

Q.2 Imagine that Hyderabad Traffic Police has started a new initiative to develop safety regulations for monitoring the cab driving in the city. For such scenario, they have put restrictions on speeding of cabs to avoid the risk of making accidents and hence, resulting in casualties. You are assigned the job of constructing a Bayesian network to help the cab drivers decide whether or not to speed. Some personnel have been assigned the duty to check the over speeding on the roads. Each of the attributes listed below is Boolean. The attribute See-Personnel indicates whether or not the driver detects the personnel; Slow-traffic indicates whether or not the vehicle

is driven at below the speed limit due to rush in the city; Speed indicates whether or not the driver speeds; Fine Chit indicates whether or not the driver gets a fine (Rs 500) for over-speeding or not; On-Time indicates whether or not the driver arrives on time to pick the concerned person or not etc. You are free to add few more attributes if you feel these will improve the outcome of uncertainty reasoning.

You are given the following information:

P(Personnel=T) = 0.1, P(See-Personnel = T|Personnel =T) = 0.6, P(See-Personnel = T|Personnel =F) = 0

P(Slow-traffic = T|Personnel =T) = 0.8, P(Slow-traffic = T|Personnel =F) = 0.3, P(Fine Chit = T|Personnel,Speed) = {0.5, if Personnel and Speed are T

and 0, otherwise}

P(On-Time= T|Fine Chit,Speed,Slow Traffic) = { 0, if Fine Chit is T,

0.9, if Fine Chit is F and Speed is T,

0.3, if Fine Chit is F, Speed is F, Slow-Traffic is F,

0.1, if Ticket is F, Speed is F and Slow-traffic is T}

Your job is to design or build a Bayesian Network for modelling the above situation. Try finding out the Joint probability distributions for the following using the Bayes Net:

a. In case the traffic is slow, will seeing the Personnel affect the probability of the cab driver getting a Fine Chit?

b. Verify the above question for the taxi being On-Time. (Assume value of Slow-Traffic is unknown).

You need to model the above Bayesian network and simulate it using SamIam tool/ Genie tool.

[12 Marks]

References:-
SamIam is a software tool for the creation and consultation of Bayesian networks. The SamIam software package can be downloaded from: http://reasoning.cs.ucla.edu/samiam/.
An alternative package is Genie, a Windows-based system, which, however, also runs on Linux using wine; it contains much more functionality than SamIam. However, as a consequence of this, Genie it is less easy to use than SamIam. Genie can be downloaded from: https://www.bayesfusion.com/.

Mode of Submission:
Maintain the same group as it was in previous assignments. Tar the entire source and executable files with your id as the tar file name (e.g. f20140055.tar) and send it to the mail id-p20150408@hyderabad.bits-pilani.ac.in. Include a readme.txt with group details in your tar file. Submit only one file per group.

 CSIS N/B, and CMS   Instructor I/C
(Date given 03.04.2018)