

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

Assignment No: 2

Total Marks: 30

Submission Date: 15.04.2021

Question 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. **[15 Marks]**

Students with even group number should build the problem (a), and with odd group number should build the problem number (b). You can find the group numbers in Assignment 1 Schedule uploaded in Google Classroom.

- (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-based 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 any other source to gather expert knowledge about some of the diseases with the given symptoms.

- (b) Build an Expert System that can recommend conferences and journals by asking the user questions about their preferences regarding their topic of research, keywords, abstract, submission deadlines, conference ranking, journal impact factor and so on. The Expert System is to make its recommendations based on the preferences. If you can provide expert advice for the journals/conferences in which the user has previously published would be an added advantage.

Note: The build to has to be implemented in Python. You can consider any of the datasets available in the Internet. Please output the rules as well which led to conclusion.

Impact Factor: - No. of Citations (current year)/No. Of Articles Published (last 2 years).

Optionally, you can create a filter that recommends journals based on the submission deadline and time taken for first decision by the Journal.

Refer to <https://www.scimagojr.com/journalrank.php>

https://drive.google.com/file/d/1MI5N3wBnksAg_A6gT48p12bt9z9x24EL/view

Question 2: BITS Hyderabad campus has started a new initiative to develop safety regulations for monitoring the speed of the vehicles inside the campus. For such scenario, they have put restrictions on speeding of vehicles 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 vehicle 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; *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.** [15 Marks]

You are given the following information:

$P(\text{Personnel}=\text{T}) = 0.8$, $P(\text{See-Personnel} = \text{T} | \text{Personnel} = \text{T}) = 0.7$, $P(\text{See-Personnel} = \text{T} | \text{Personnel} = \text{F}) = 0.1$

$P(\text{Slow-traffic} = \text{T} | \text{Personnel} = \text{T}) = 0.6$, $P(\text{Slow-traffic} = \text{T} | \text{Personnel} = \text{F}) = 0.5$,

$P(\text{Fine Chit} = \text{T} | \text{Personnel}, \text{Speed}) = \{0.4, \text{ if Personnel and Speed are T and } 0.2, \text{ otherwise}\}$

$P(\text{On-Time} = \text{T} | \text{Fine Chit}, \text{Speed}, \text{Slow Traffic}) = \{ 0.1, \text{ if Fine Chit is T; } 0.7, \text{ if Fine Chit is F and Speed is T; } 0.5, \text{ if Fine Chit is F, Speed is F, Slow-Traffic is F; } 0.3, \text{ if Ticket is F, Speed is F and Slow-traffic is T}\}$

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 vehicle driver getting a Fine Chit?
- (b) Verify the question 2(a) for the vehicle being On-Time. (Assume value of Slow-Traffic is unknown). You need to model the above Bayesian network and simulate it using Samlam tool/ Genie tool.

Samlam is a software tool for the creation and consultation of Bayesian networks. The Samlam 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 Samlam. However, as a consequence of this, Genie it is less easy to use than Samlam. 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: p20190057@hyderabad.bits-pilani.ac.in. Include a readme.txt with group details in your tar file. ****Submit only one file per group.**