**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI**

Batch No. :

**DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION SYSTEMS**

**Artificial Intelligence (BITS F444/ CS F407)**

**I Semester 2018-19**

**Programming Assignment-6**

**Coding Details**

**(November 29, 2018)**

*Instruction: Type the details precisely and neatly*

1. ID \_\_\_2017H1120241P\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Monisha Nair\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Mention the names of Submitted files :
   1. Submission6.py
2. Total number of submitted files: 1 \_\_\_\_\_\_\_\_\_\_\_
3. Name of the folder :\_\_\_\_\_\_\_\_\_\_\_\_\_2017H1120241P\_\_\_\_\_\_\_\_\_\_\_\_
4. Have you checked that all the files you are submitting have your name in the top?(yes/)
5. Have you checked that all the files you are submitting are in the folder as specified in 4 (and no subfolder exists)?(yes)
6. Modules implemented
   1. Created the Bayesian network? (yes)
   2. Created Markov blanket?( yes)
   3. Created expression from the inputs read ?(yes)
   4. Computed probability ? (yes)
7. Data structures used
   1. To represent the Bayesian network: graph , used adjacency list representation implemented using hashmap in python , \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. To represent Markov blanket:\_\_\_ graph , used adjaceny list representation implemented using hashmap in python \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. To represent the variables: string or list as required in the function\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. To represent the expression for probabilistic query:\_\_represented as string\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. Implementation Details
   1. How did you create the CPT reading the data from the file? I created a 2 graphs one representing the parent child relation between the nodes and the second representing the different expression as key and their value as probability.
   2. How did you access the BN to obtain the Markov blanket? Accessed all the variables in the expression from the BN and their parents and added them to markov blanket , such that each variable is the key and obtained their value from BN graph
   3. How did you access the CPTs? Given a combination of query and condition variables I had stored them in the probability graph , given a combination used it as the key to get from map
   4. How did you expand the expression for the conditional dependence on variables?

P(A,B,C|D,E) = P(A,B,C,D,E)/P(D,E) , futher added all the associated variables from Markov’s Blanket and calculated the joint probabilities using marginalization , chain rule and bayes theorem

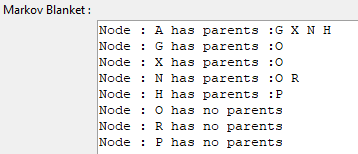
* 1. How did you marginalize the expression? for every value in term , I created 2 lists , one with variables present in the expression that will not get enumerated , in a second list I added all the associated variables of the variables present in the expression from markov blanket , for this second list I generated all enumerations and cross joined with the first list then Applied chain rule for conditional query
  2. How many terms does a query have? Give example. Query min = 1 max = 10 , condition min = 0 max = 10



* 1. How have you handled the conditional independence of variables? By using Markovs Blanket , to marginalize a term we need to enumerate over all variables other than the ones present in the expression , By applying markovs blanket computations over some variables which were not present in the markov blanket of the expression can be saved.

1. Graphics: Created the graphics (yes/no)\_\_\_\_\_yes\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Output
   1. Execute your program to answer the following probabilistic queries. Mention the answer obtained by your program. Also compute the Markov blanket of the variable A.

* P(D, A, L| R, X, P, O) = 0.09974328676359073
* P(A)= 0.22758768058157097
* P(F,R|A,P)= 0.12814958359294062
* P(D)= 0.4721225467846717
* P(D|P)= 0.5065278266797951
* P(A|Y, C)= 0.04895618973565344
* P(A,D|O,R,P)= 0.2242321037883777
* Markov Blanket of A=



1. Compilation Details:
   1. Code Compiles (Yes/ No):\_\_\_\_\_\_\_\_yes\_\_\_\_\_\_
   2. Mention the .py files that do not compile:\_\_\_\_\_\_Submission6.py\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Any specific function that does not compile:\_\_\_\_\_\_\_\_\_\_\_\_\_\_none\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. Ensured the compatibility of your code with the specified Python version(yes/no)\_\_yes\_\_\_\_\_\_\_\_\_\_
   5. Instructions for compilation of your files mentioning the multi file compilation process used by you (We may use the replica of these for compiling your files while evaluating your code)
2. Driver Details: Does it take care of the options specified earlier(yes/no):\_\_\_yes\_\_\_\_\_\_\_\_
3. Execution status (describe in maximum 2 lines) :

Everything has been implemented as mentioned in the question , to run a new query execute the program afresh i.e in a particular execution where values are already displayed if we try to run a new query old results will be shown , to get correct result close the program and reopen it, select the query and execute it.

1. Declaration: I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_Monisha Nair\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (name) declare that I have put my genuine efforts in creating the python code for the given programming assignment and have submitted only the code developed by me. I have not copied any piece of code from any source. If the code is found plagiarized in any form or degree, I understand that a disciplinary action as per the institute rules will be taken against me and I will accept the penalty as decided by the department of Computer Science and Information Systems, BITS, Pilani.

ID\_\_\_\_\_\_\_\_\_2017H1120241P\_\_\_\_\_\_\_\_\_\_\_\_ Name:\_\_Monisha Nair\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_29/11/2018\_

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