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

Batch No. :

**DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION SYSTEMS**

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

**I Semester 2017-18**

**Programming Assignment-5**

**Coding Details**

**(November 28, 2017)**

*Instruction: Type the details precisely and neatly*

1. ID 2015A7PS0111P

Name T NAGA DATTA MADHU KIRAN

1. Mention the names of Submitted files :
   1. main.py
   2. gui.py
   3. input1.txt
   4. input2.txt
   5. input3.txt
   6. 2015A7PS0111P.docx
2. Total number of submitted files: 6
3. Name of the folder :2015A7PS0111P
4. Have you checked that all the files you are submitting have your name in the top? yes (all the .py have name and id at the top.)
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: A dictionary with key as name of node (variable), value as node itself.
   2. To represent Markov blanket: A class to hold children, parents, parents of children and name of node and also implemented some basic accessor methods.
   3. To represent the variables: A class node with attributes as its parents ,its name, its children and cpt.
   4. To represent the expression for probabilistic query: A class with attributes as conditional variables and query variables.
8. Implementation Details
   1. How did you create the CPT reading the data from the file?

As a dictionary with key as tuple(sorted one) and value as corresponding truth value.(example {(~G,~X,~N,~H):0.001 and so on..})

* 1. How did you access the BN to obtain the Markov blanket?

Since BN is dictionary with key as name of the variable, we can directly access the BN in obtaining Markov Blanket.

* 1. How did you access the CPTs?

As mentioned in 9.a cpt is dictionary with key as tuple. Therefore, it can be directly accessed using key.

* 1. How did you expand the expression for the conditional dependence on variables?Applied P(X|Y)=P(X,Y)/P(Y) and called compute Probability function. Briefly first used bayes theorem to make it into numerator and denominator. Then used markov blankets for numerator and denominators. Applied marginalization and product rules for joint distributions individually to numerator and denominator.
  2. How did you marginalize the expression?

First I have computed all hidden variables by using the all\_combination function to get all kind of combination of terms and append each of them in required manner and I have calculated required individual probabilities and took sum of them.

* 1. How many terms does a query have? Give example.

A Query can have maximum of 10 query variables (at least 1 Query variable) and a maximum of 10 Conditional variables as mentioned in the problem statement. Example P(D,X,L|P,R, Y).

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) = 0.0997432867636
* P(A)= 0.227587680582
* P(F,R|A,P)= 0.128149583593
* P(D)=0.472122546785
* P(D|P)= 0.50652782668
* P(A|Y, C)= 0.0489561897357
* P(A,D|O,R,P)=0.224232103788
* Markov Blanket of A=[A,C,B,D,G,F,H,L,N,Y,X]

1. Compilation Details:
   1. Code Compiles (Yes/ No):Yes
   2. Mention the .py files that do not compile: None
   3. Any specific function that does not compile: None
   4. Ensured the compatibility of your code with the specified Python version 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) >>python main.py
2. Driver Details: Does it take care of the options specified earlier:Yes
3. Execution status (describe in maximum 2 lines)

Working perfectly as per specification. Also added features like New Query and Exit in GUI.

1. Declaration: I, T NAGA DATTA MADHU KIRAN 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 2015A7PS0111P Name: T NAGA DATTA MADHU KIRAN

Date: 27-11-2017

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