

CS440
ASSIGNMENT 6
DUE MAY 10, 2019

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Preliminaries. In this assignment, you will write a program to calculate a joint probability from a given Bayesian network model. For simplicity, we assume all variables are binary and take values in $\{T, F\}$. Variables (nodes) are numbered 1 thru n .

Input files. There are two input files to your program:

- Bayesian network `network.txt`: the first line specifies n . Subsequent lines are composed of blocks. Each block starts with a line in the format

$k \quad c \quad p_1 \quad p_2 \quad \cdots \quad p_k,$

in which k is the number of parents $p_1, p_2, \dots, p_k \in \{1 \dots n\}$ of variable $c \in \{1 \dots n\}$. There are exactly 2^k subsequent lines in the current block specifying the probability of c being T given all the parents, i.e. $P(c = T \mid p_1, p_2, \dots, p_k)$. Each such line has k values in $\{T, F\}$ followed by one probability. For instance, let Burglary, Earthquake, Alarm, JohnCalls, and MaryCalls be the variables 1 thru 5. In that case,

```
line 1:    5
line 2:    0    1
line 3:  0.001
line 4:    0    2
line 5:  0.002
line 6:    2    3    1    2
line 7:    T    T    0.95
line 8:    T    F    0.94
line 9:    F    T    0.29
line 10:   F    F    0.001
line 11:    1    4    3
line 12:   T   0.90
line 13:   F   0.05
line 14:    1    5    3
line 15:   T   0.70
line 16:   F   0.01
```

is `network.txt` for Figure 14.2 of the textbook.

- Query `query.txt`: there is one line in the query consisting in the values of the n variables. For instance for the above example,
F F F T T.

Input files will be placed in the current directory.

Output. Your program must print the joint probability, one number, in the output. To standardize the format of floating point numbers, print your probability with exactly 6 digits after the decimal point (default `%f` in C `printf`). Hence, your output will have precisely 8 characters: `0.xxxxxx`.

Grading. We will test your program on 10 different inputs and let it run for 30 seconds each. Each test case is worth 10 points. If the output is correct, you get 10 points; otherwise, you get 0.

Upload your answer on Canvas in one zip file or tarball. Include a README file with running instructions and all the code/scripts you have written.