MIE1516 Winter 2018 Assignment 1 (10%)

1. [2 points] Compute P(A|C) (assuming A is independent of C given B) from the following distributions and show your intermediate calculations (i.e., show the intermediate tables you produce):

P(A|B) =

A	B	Pr
T	T	.1
T	F	.7
F	T	.9
F	F	.3

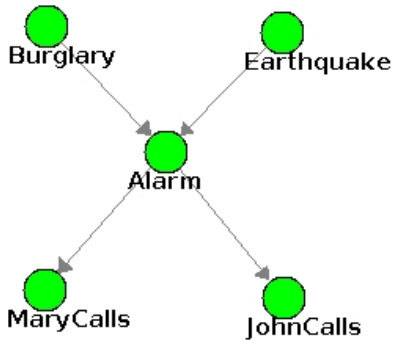
P(B|C) =

B	C	Pr
T	T	.6
T	F	.5
F	T	.4
F	F	.5

P(C) =

C	Pr
T	.2
F	.8

2. [1 point] What is a good variable ordering (consider the first variable in your list to be the first to be eliminated) for variable elimination with the query P(MaryCalls|JohnCalls=true) in the boolean network at the right? What is a bad choice of ordering? Explain why.



3. [7 points] Using the API calls of pgmpy as guidance, implement your own simple Bayes net toolbox that supports construction of a Bayes net assuming *all variables are binary* (i.e., any variable can have any parents where you can assume only legal DAGs are specified). You should implement *variable elimination* as the inference algorithm and you should support any marginal query (arbitrary query variable and arbitrary evidence). You do not need to implement exactly the pgmpy interface (e.g., you don't need to specify variable cardinality), but your tool should accept the same CPD format as pgmpy to facilitate testing / grading. To test, you need to show a comparison of pgmpy vs. your tool with 2 Bayes nets (each having at least 5 variables) and 3 different queries per Bayes net. Your numerical results should match pgympy's results. During grading (in lab), you will be asked to show query results with a third Bayes net and queries we will provide at grading time.