Probabilistic Graphical Models

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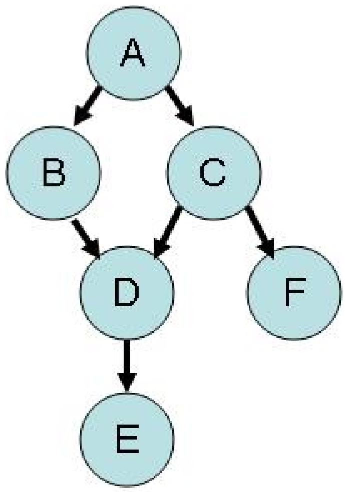
Feedback — Message Passing for MAP + Week 3 Revie

You achieved a score of 5.00 out of 5.00

Question 1

Induced Graphs. If we perform variable elimination on the graph shown below with the variable ordering B, A, C, F, E, D, what is the induced graph for the run?



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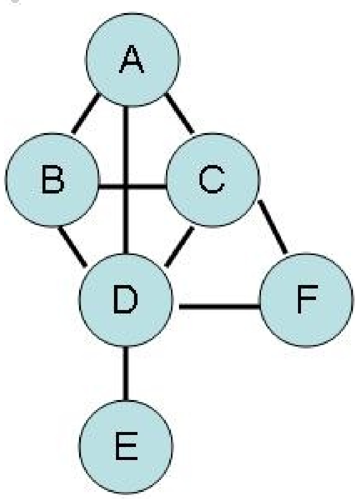
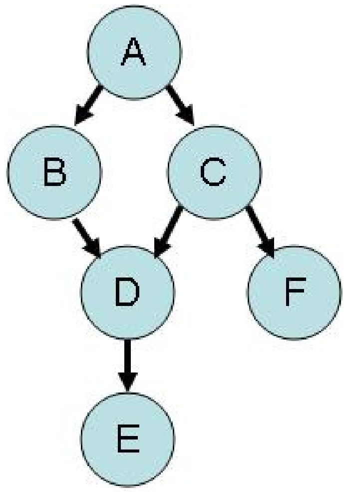
Your Answer		Score	Explanation
		1.00	This is correct. There is an edge in the induc between every pair of variables that is prese together in a factor during a run of variable el

Total	1.00

Question 2

Intermediate Factors. If we perform variable elimination on the graph shown below with the variable ordering F, E, D, C, B, A, what is the intermediate factor produced by the third step (just before summing out D)?



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Your Answer		Score	Explanation
$\psi(B, C, D)$	✔	1.00	This is correct. The factors involved in eliminating D are $\phi(B, C, D) = P(D \mid B, C)$ and $\tau_2(D)$ (from eliminating E), s intermediate factor generated before eliminating D is the product two factors, $\psi(B, C, D) = \phi(B, C, D)\tau_2(D)$.
Total		1.00	

Question 3

Clique Tree Calibration. When is a clique tree is max-calibrated ? You may select more than on none, if you think none apply).

Your Answer		Score	Explanation
Any two adjacent cliques are max-calibrated.	✔	0.25	It is true that adjacent cliques ha max-calibrated, but all adjacent need to be max-calibrated, not ju two.
Any two of its cliques are max-calibrated.	✔	0.25	All adjacent cliques have to agre their sepset beliefs.

☑ We completed one upward pass and one downward pass of the max-product message passing algorithm.	✔	0.25	All adjacent cliques have to agre their sepset beliefs.
☐ We completed one upward pass of the max-product message passing algorithm.	✔	0.25	The beliefs are max-calibrated a do a downward pass.
Total		1.00	

Question 4

Real-World Applications of MAP Estimation. Suppose that you are in charge of setting up a sc league for a bunch of kindergarten kids, and your job is to split the N children into K teams. The p very controlling and also uptight about which friends their kids associate with. So some of them br set up the teams in certain ways.

The parents' bribe can take two forms: For some children i, the parent says "I will pay you A_{ij} do put my kid i on the same team as kid j"; in other cases, the parent of child i says "I will pay you I you put my kid on team k." In our notation, this translates to factor $f_{i,j}(x_i, x_j) = A_{ij} \cdot \mathbf{1}\{x_i = x$ $g_i(x_i) = B_i \cdot \mathbf{1}\{x_i = k\}$, respectively, where x_i is the assigned team of child i and $\mathbf{1}\{\}$ is the function. More formally, if we define x_i to be the assigned team of child i, the amount of money yo the first type of bride will be $f_{i,j}(x_i, x_j)$.

Being greedy and devoid of morality, you want to make as much money as possible from these br are you trying to find?

Your Answer		Score	Explanation
◉ $\operatorname{argmax}_{\bar{x}} \sum_i g_i(x_i) + \sum_{i,j} f_{i,j}(x_i, x_j)$	✔	1.00	Correct. The total amount of money sum of the indicator functions, so yo to find the assignment that maximiz sum.
Total		1.00	

Question 5

***Decoding MAP Assignments.** You want to find the optimal solution to the above problem using tree over a set of factors ϕ. How could you accomplish this such that you are guaranteed to find t solution? (Ignore issues of tractability, and assume that if you specify a set of factors ϕ, you will b valid clique tree of minimum tree width.)

Your Answer	Score	Explanation

Set $\phi_{i,j} = \exp(f_{i,j})$, $\phi_i = \exp(g_i)$, get the clique tree over this set of factors, run max-sum message passing on this clique tree, and decode the marginals.	✔	1.00	We want to compute $\text{argmax}_{\bar{x}} \sum_i g_i(x_i) + \sum_{i,j} f_{i,j}(x_i, x_j) = \log\left[\prod_i \exp(\right.$ Since maximizing $\log(z)$ over z is the same as maximizing $\text{argmax}_{\bar{x}} \prod_i \exp(g_i(x_i)) \cdot \prod_{i,j} \exp(f_{i,j}(x_i, x_j))$, whic passing returns. So setting the potentials appropriately and (which is exact) is guaranteed to get the optimal solution. (Remember that max-sum message passing involves takin first, and summing up log-transformed factors is equivalent be tricked by the "sum"!)
Total		1.00	