Message Passing in Cluster Graphs

4/5 得分（80%)

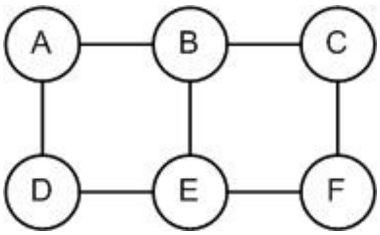
测验通过！

返回第 2 周课程

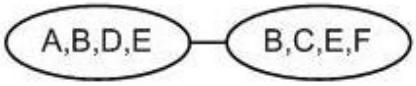
1 / 1 分

1.

Cluster Graph Construction. Consider the pairwise MRF, H, shown below with potentials over {A,B}, {B,C}, {A,D}, {B,E}, {C,F}, {D,E} and {E,F}.

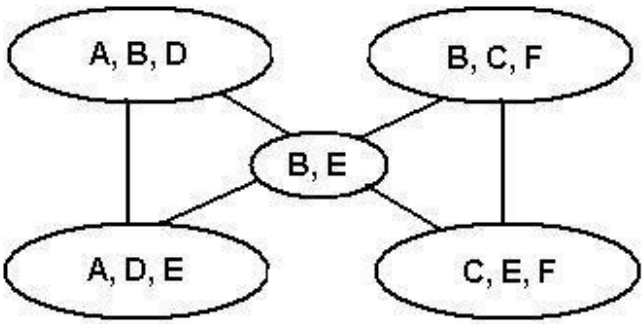


Which of the following is/are valid cluster graph(s) for H? (A cluster graph is valid if it satisfies the running intersection property and family preservation. You may select 1 or more options).



正确

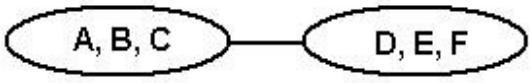
This graph is valid because it satisfies the running intersection property for a clique tree and family preservation.



正确

This graph is valid because it satisfies the running intersection property for cluster graphs and family preservation.

未选择的是正确的



未选择的是正确的

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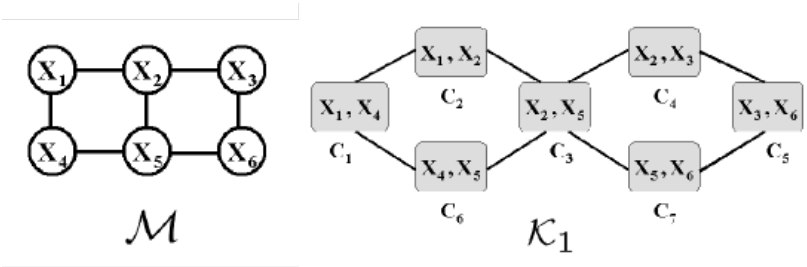
2.

Message Passing in a Cluster Graph.

Suppose we wish to perform inference over the Markov network M as shown below. Each of the variables X_i are binary, and the only potentials in the network are the pairwise potentials $\phi_{i,j}(X_i, X_j)$, with one potential for each pair of variables X_i, X_j connected by an edge in M . Which of the following expressions correctly computes the message $\delta_{3\to 6}$ that cluster C_3 will send to cluster C_6 during belief propagation? Assume that the variables in the sepsets are equal to the intersection of the variables in the adjacent cliques.



- $\delta_{3\to 6}(X_5) = \sum_{X_2} \phi_{2,5}(X_2, X_5)$
- $\delta_{3\to 6}(X_2) = \sum_{X_5} \phi_{2,5}(X_2, X_5)\delta_{2\to 3}(X_2)\delta_{4\to 3}(X_2)\delta_{7\to 3}(X_5)$
- $\delta_{3\to 6}(X_5) = \sum_{X_2} \phi_{2,5}(X_2, X_5)\delta_{2\to 3}(X_2)\delta_{4\to 3}(X_2)\delta_{7\to 3}(X_5)$

正确

This is the correct message; we first multiply in all the incoming messages from cluster 2, 4 and 7 with the initial potential $\phi_{2,5}(X_2, X_5)$ and then sum out X_2 .

- $\delta_{3\to 6}(X_5) = \sum_{X_2} \phi_{2,5}(X_2, X_5)\delta_{2\to 3}(X_2)\delta_{4\to 3}(X_2)\delta_{7\to 3}(X_5)\delta_{6\to 3}(X_2)$

1 / 1 分

3.

Message Passing Computation. Consider the Markov network M from the previous question. If the initial factors in the Markov network M are of the form as shown in the table below, regardless of the specific value of i, j (we basically wish to encourage variables that are connected by an edge to share the

same assignment), compute the message $\delta_{3\to 6}$, assuming that it is the first message passed during in loopy belief propagation. Assume that the messages are all initialized to the 1 message, i.e. all the entries are initially set to 1.

Separate the entries of the message with spaces. Order the entries by lexicographic variable order: for example, if the message is over one variable X_i , then enter in $\delta_{3\to 6}(X_i = 0)$ $\delta_{3\to 6}(X_i = 1)$. If the message is over two variables X_i , X_j , where $i < j$, enter the answers in the order $\delta_{3\to 6}(X_i = 0, X_j = 0)$ $\delta_{3\to 6}(X_i = 0, X_j = 1)$ $\delta_{3\to 6}(X_i = 1, X_j = 0)$ $\delta_{3\to 6}(X_i = 1, X_j = 1)$.

X_i	X_j	$\phi(X_i, X_j)$
1	1	10
1	0	1
0	1	1
0	0	10

11 11

正确回答

Show other acceptable responses

0 / 1 分

4.
***Extracting Marginals at Convergence.** Given that you can renormalize the messages at any point during belief propagation and still obtain correct marginals, consider the message $\delta_{3\to 6}$ that you computed. Use this observation to compute the final and possibly approximate marginal probability $P(X_4 = 1, X_5 = 1)$ (X_4 and X_5 are the variables in the previous question) in cluster C_6 at convergence (as extracted from the cluster beliefs), giving your answer to 2 decimal places.

在此输入您的回答

不正确回答
The answer you gave is not a number.

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1 / 1 分

5.
Family Preservation. Suppose we have a factor $P(A \mid C)$ that we wish to include in our sum-product message passing inference. We should:

- Assign the factor to **one** clique that contain A **or** C
- None of these
- Assign the factor to **one** clique that contain A **and** C

正确
Family Preservation explains that the proper construction of a clique tree (cluster graph) requires assigning each factor to one cluster whose scope contains the scope of the factor.

- Assign the factor to **all** cliques that contain A **and** C
