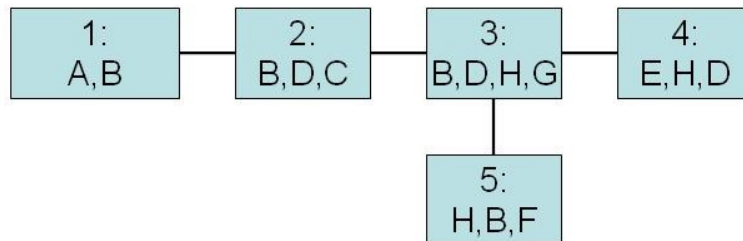# Clique Tree Algorithm

✔ **5/5** 得分（100%）

返回第 2 周课程

✔ 1 / 1 分

1.

Message Ordering. In the clique tree below which of the following starting message-passing orders is/are valid? (Note: These are not necessarily full sweeps that result in calibration. You may select 1 or more options.)

☐ $C_1 \to C_2, C_2 \to C_3, C_3 \to C_4, C_3 \to C_5$

未选择的是正确的

☐ $C_4 \to C_3, C_3 \to C_2, C_2 \to C_1$

未选择的是正确的

☐

☐ $C_4 \to C_3, C_5 \to C_3, C_2 \to C_3$

未选择的是正确的

☑ $C_1 \to C_2, C_2 \to C_3, C_5 \to C_3, C_3 \to C_4$

正确

This is a valid ordering because cliques only pass messages when they are ready.

✔ 1 / 1 分

2.

Message Passing in a Clique Tree. In the clique tree above, what is the correct form of the message from clique 3 to clique 2, $\delta_{3\to2}$, where $\psi_i(C_i)$ is the initial potential of clique i ?

○ $\sum_{B,D,G,H} \psi_3(C_3) \times \delta_{4\to3} \times \delta_{5\to3}$

○ $\sum_{B,D} \psi_3(C_3)$

◉ $\sum_{G,H} \psi_3(C_3) \times \delta_{4\to3} \times \delta_{5\to3}$

正确

This is correct; to compute a message, we need to multiply the initial potential of clique 3 by all the incoming messages except the one from clique 2 and eliminate the variables that are not in the sepset.
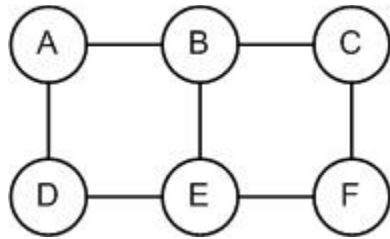
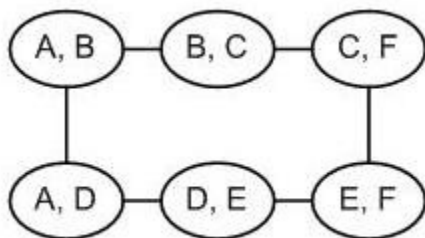○ $\sum_{B,D} \psi_3(C_3) \times \delta_{4\to3} \times \delta_{5\to3}$

✔ 1 / 1 分

3.

Clique Tree Properties. Consider the following Markov Network over potentials $\phi_{A,B}, \phi_{B,C}, \phi_{A,D}, \phi_{B,E}, \phi_{C,F}, \phi_{D,E}$, and $\phi_{E,F}$:

Which of the following properties are necessary for a valid clique tree for the above network, but are NOT satisfied by this graph:

You may select 1 or more options.

- ☑ No loops

  ▲

  正确
  The graph contains a loop, so it's not a clique tree.

- ☐ Running intersection property

  ▲

  未选择的是正确的

- ☐ Node degree less than or equal to 2

  ▲

  未选择的是正确的

- ☑ Family preservation

  ▲

  正确
  Family preservation is violated because $\phi_{B,E}$ cannot

be assigned anywhere.

4.

Cluster Graphs vs. Clique Trees. Suppose that we ran sum-product message passing on a cluster graph G for a Markov network M and that the algorithm converged. Which of the following statements is true **only if** G is a clique tree and is **not** necessarily true otherwise?

○ The sepsets in G are the product of the two messages passed between the clusters adjacent to the sepset.

○ G is calibrated.

○ All the options are true for cluster graphs in general.

○ The beliefs and sepsets of G can be used to compute the joint distribution defined by the factors of M .

◉ If there are E edges in G , there exists a message ordering that guarantees convergence after passing $2E$ messages.

▲

正确

This is a property specific to clique trees. We can select one of the cliques to be the root clique, and pass messages away from the root clique to all other cliques. Then, we can pass messages from all other cliques towards the root clique and we are guaranteed to have calibrated the tree. In a cluster graph however, depending on the potentials, convergence may take longer.

5.

Clique Tree Calibration. Which of the following is true? You may select more than one option.

☑ If a clique tree is max-calibrated, then all pairs of cliques are max-calibrated.

▲

正确
N/A

☐ If a clique tree is max-calibrated, then within each clique, all variables are max-calibrated with each other.

▲

未选择的是正确的

☐ If there exists a pair of adjacent cliques that are max-calibrated, then a clique tree is max-calibrated.

▲

未选择的是正确的

☑ After we complete one upward pass and one downward pass of the max-sum message passing algorithm, the clique tree is max-calibrated.

▲

正确
As with sum-product inference in clique trees, this is sufficient to ensure that all adjacent cliques agree on their sepset beliefs.