

CS726 Scribe Notes

Saksham (22B1003), Sharvaneer (22B0943), Deeksha (22B0988)

Department of Computer Science,
Indian Institute of Technology Bombay

1 Marginal Probability

Here is the pseudocode for sharing messages between the maximal cliques of the graph.

Firstly, we show how to calculate the Z value for the given graph.

Algorithm 1 Computation of Partition Function Z

Require: Graphical Model with maximal cliques and potentials**Ensure:** Partition function Z

```

1: Construct the junction tree  $JT$  from maximal cliques
2: Initialize adjacency list  $JT_{adj}$  from  $JT$ 
3: Select a root clique  $C_{root}$ 
4: Initialize depth map with  $C_{root}$  at depth 0
5: function DFS( $node, parent, depth$ )
6:   for each child in  $JT_{adj}[node]$  do
7:     if child  $\neq$  parent then
8:       Update depth map
9:       Call DFS on child with depth +1
10:    end if
11:  end for
12: end function
13: Perform DFS from  $C_{root}$ 
14: function SENDMESSAGE( $C_{from}, C_{to}$ )
15:   Compute separator set  $S = C_{from} \cap C_{to}$ 
16:   Initialize message vector  $M$  of size  $2^{|S|}$ 
17:   Modify clique potential based on incoming messages
18:   for each state assignment in  $C_{from}$  do
19:     Compute corresponding separator index
20:     Aggregate message value
21:   end for
22:   Store message  $M(C_{from} \rightarrow C_{to})$ 
23: end function
24: Initialize messages dictionary
25: Initialize clique potentials
26: for each clique from deepest to root do
27:   Send messages to parent cliques
28: end for
29: for each clique from root to leaves do
30:   Send messages to child cliques
31: end for
32: Compute partition function  $Z$  using root clique potential and received messages
33: return  $Z$ 

```
