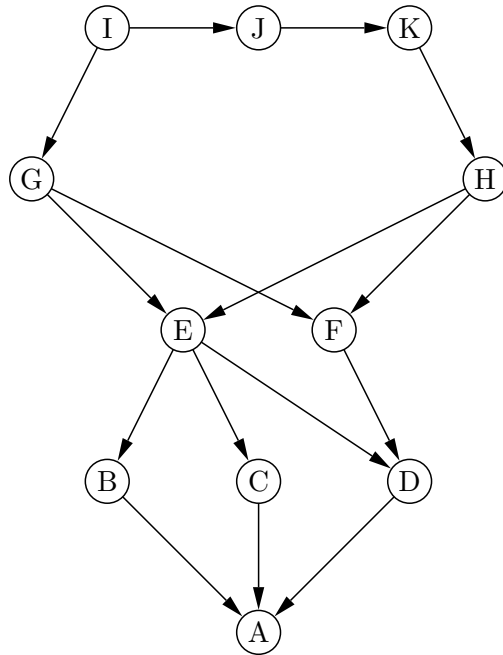


Homework 4 - Graphical Models

Machine Learning - Spring 2011 - Prof. Rosenberg

Due April 29 at 11:50pm

Problem 1) (30 pts.) Draw a Junction Tree based on the following graphical model. Show the steps of moralization, triangulation and construction of the junction tree.



Problem 2) (45 pts.) Hidden Markov Models.

Assume a hidden markov model with discrete states and observations. There are 3 possible states $\{X, Y, Z\}$ and 4 possible observations $\{A, B, C, D\}$.

Using the given α , η and π tables and 6 observations, determine the marginal likelihoods for each state $q_0, q_1, q_2, q_3, q_4, q_5$, given the following observations: A, B, A, B, D, C (Note: observations are numbered 0 through 5). Show your work.

| | | |
|----|----|----|
| X | Y | Z |
| .5 | .3 | .2 |

Table 1: π Table

| | | | | |
|-------|---|-----------|----|----|
| | | q_{t+1} | | |
| | | X | Y | Z |
| q_t | X | .5 | .3 | .2 |
| | Y | .1 | .8 | .1 |
| | Z | .3 | .3 | .4 |

Table 2: α Table

| | | | | | |
|-------|---|-------|----|----|----|
| | | x_t | | | |
| | | A | B | C | D |
| q_t | X | .3 | .4 | .1 | .2 |
| | Y | .1 | .2 | 0 | .7 |
| | Z | .1 | .1 | .4 | .4 |

Table 3: η Table