

1 Graphical Models Representation:

1. Factorization of the joint probability:

$$\begin{aligned}
 P(Y, A, B, C) &= P(Y|A, B, C) * P(A, B, C) \\
 &= \frac{P(A, B, C|Y) * P(Y)}{P(A, B, C)} * P(A, B, C) \\
 &= P(A, B, C|Y) * P(Y) \\
 &= P(A|Y) * P(B|Y) * P(C|Y) * P(Y)
 \end{aligned}$$

The tree is as shown below:

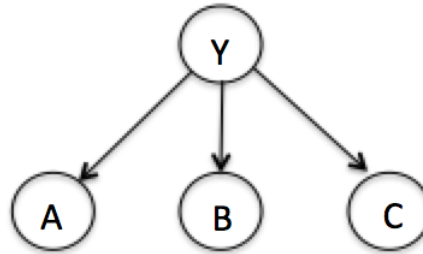


Figure 1

2. Given A is also dependent on C.

$$P(Y, A, B, C) = P(Y) * P(A|Y, C) * P(B|Y) * P(C|Y)$$

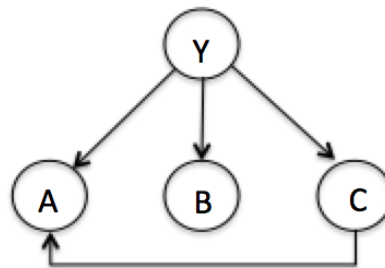


Figure 2

3. All the variables that need to be considered for classifying the document would be those that are independent of Y. They are : D,F,G,E

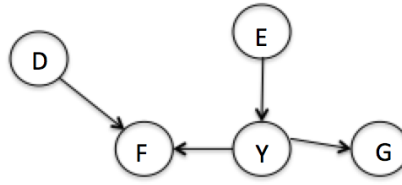


Figure 3

4. Factorization of the joint probability:

$$P(Y, D, F, G, E) = P(Y|E) * P(D) * P(F|D, Y) * P(G|Y) * P(E)$$