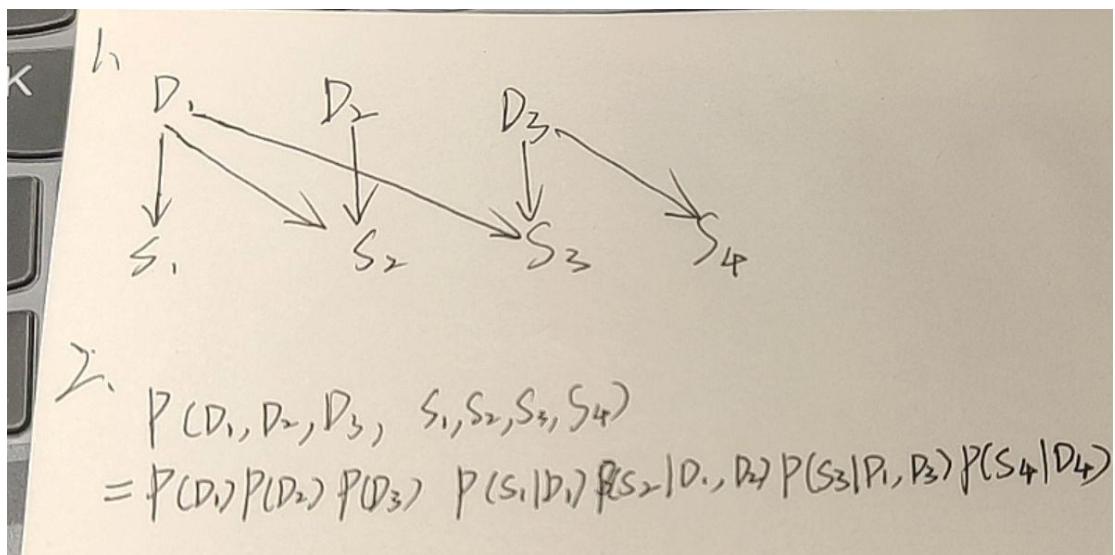


Network Basics



D-Separation

1. False, Party \rightarrow HW \leftarrow Smart \rightarrow Project \rightarrow Success
2. False, Creative \rightarrow Project \rightarrow Success \rightarrow Happy
3. False, Party \rightarrow Happy \leftarrow Success
4. False, Creative \rightarrow Project \rightarrow Success \rightarrow Happy \leftarrow Party
5. True.

Inference

$$\begin{aligned}
 1. \quad & P(A=F, B=F, C=F, D=F, E=F) \\
 & = P(A=F) P(B=F) P(C=F) P(D=F | A=F, B=F) \\
 & \quad P(E=F | B=F, C=F) \\
 & = 0.8 \times 0.5 \times 0.2 \times 0.1 \times 0.8 \\
 & = 0.0064
 \end{aligned}$$

$$\begin{aligned}
 2. \quad & P(A=F | B=T, C=T, D=T, E=T) \\
 & = \frac{P(A=F, B=T, C=T, D=T, E=T)}{P(B=T, C=T, D=T, E=T)} \\
 & = \frac{P(A=F) P(B=T) P(C=T) P(D=T | A=F, B=T) P(E=T | B=T, C=T)}{P(B=T, C=T, D=T, E=T)} \\
 & = \frac{0.8 \times 0.5 \times 0.8 \times 0.6 \times 0.3}{0.96}
 \end{aligned}$$

Variable Elimination

1. Eliminate X_1

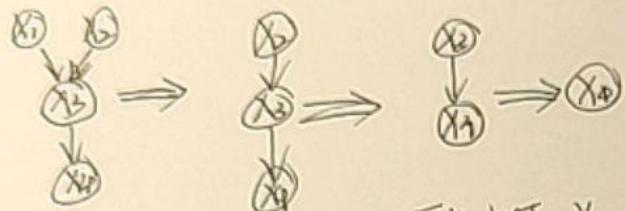
X_3	X_2	$P(X_4 X_3, X_2)$
0	0	0.78
1	0	0.22
0	1	0.49
1	1	0.59

Eliminate X_2

X_3	$P(X_4 X_3)$
0	0.622
1	0.368

Eliminate X_3

X_4	$P(X_4)$
0	0.4172
1	0.5808

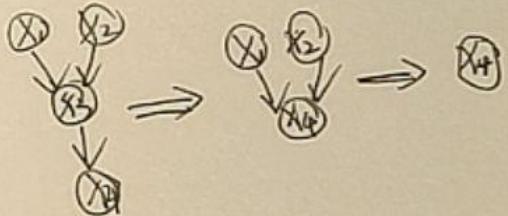


2. Eliminate X_3

X_4	X_1	X_2	$P(X_4 X_1, X_2)$
0	0	0	0.4
0	0	1	0.22
0	1	0	0.16
0	1	1	0.61
1	0	0	0.6
1	0	1	0.78
1	1	0	0.84
1	1	1	0.69

Eliminate X_1, X_2

X_4	$P(X_4)$
0	0.4972
1	0.5028



3. 24 and 16

So Eliminate X_1 first.