

Exercise 1 TDT4171 Sondre Foslien

February 13, 2018

I 5-card Poker Hands

a)

$$52 \cdot 51 \cdot 50 \cdot 49 \cdot 48 = 311875200$$

b)

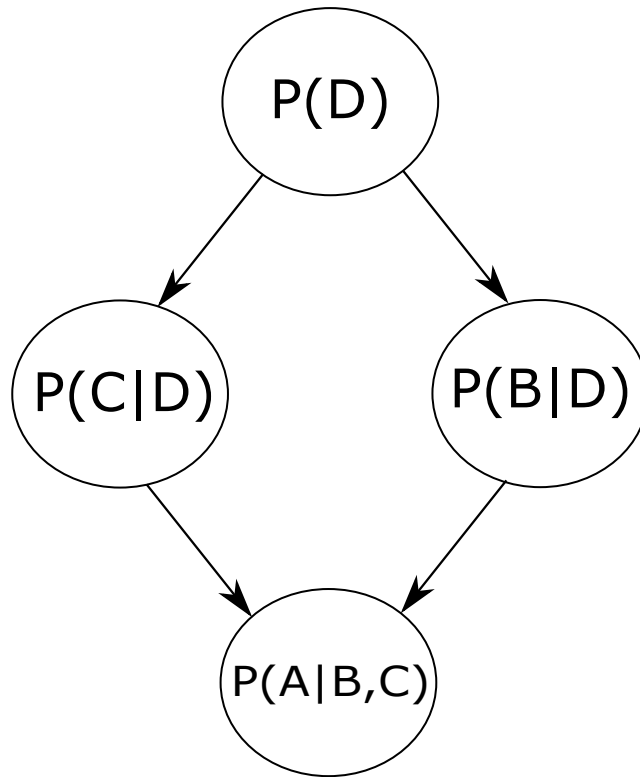
$$\frac{1}{311875200}$$

c)

$$P(\text{Royal flush}) = 4 \cdot \frac{1}{311875200} = \frac{1}{77968800}$$
$$P(\text{Four of a kind}) = 13 \cdot \frac{1}{311875200} = \frac{1}{23990400}$$

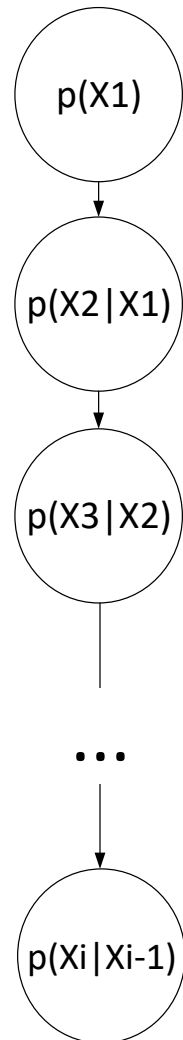
II Bayesian Network Construction

1.



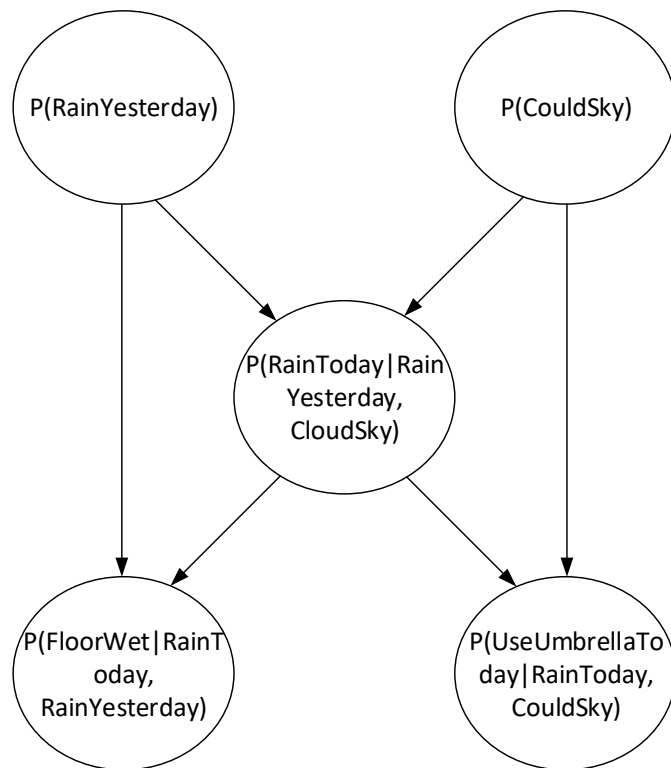
$P(D)$	D	$P(C D)$	D	$P(B D)$	B	C	$P(A B,C)$
0.5	F	0.33	F	0.45	F	F	0.1
	T	0.33	T	0.1	F	T	0.2
					T	F	0.3
					T	T	0.4

2.



$\frac{P(X_1)}{0.4}$	$\frac{X_1}{F}$	$P(X_2 X_1)$	$\frac{X_2}{F}$	$P(X_3 X_4)$...	$\frac{X_{i-1}}{F}$	$P(X_i X_{i-1})$
	T	0.9	T	0.8		T	0.6
		0.1		0.45			0.55

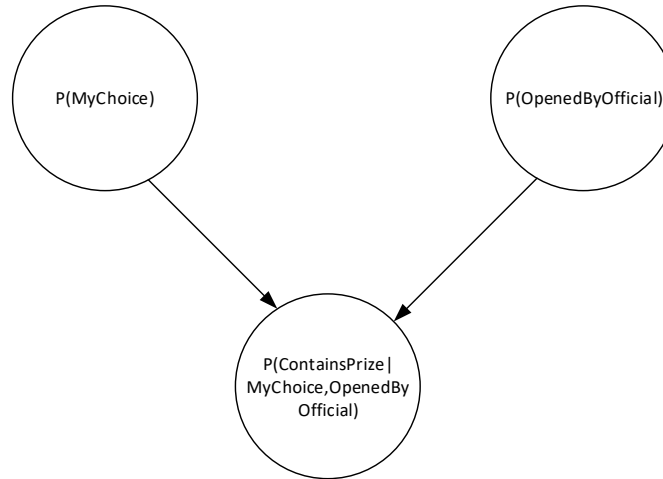
3.



$P(\text{RainYesterday})$		$P(\text{CloudSky})$
0.25		0.5
RainYesterday	CloudSky	$P(\text{RainToday} \text{RainYesterday}, \text{CloudSky})$
F	F	0.25
F	T	0.5
T	F	0.2
T	T	0.4
RainToday	RainYesterday	$P(\text{FloorWet} \text{RainToday}, \text{RainYesterday})$
F	F	0.1
F	T	0.5
T	F	0.9
T	T	0.99

RainToday	CloudSky	P(UseUmbrellaToday RainToday, CloudSky)
F	F	0.01
F	T	0.3
T	F	0.9
T	T	0.99

III Bayesian Network Application



$$\frac{P(\text{MyChoice})}{0.33}$$

$$\frac{P(\text{OpenedByOfficial})}{0.33}$$

MyChoice	OpenedByOfficial	P(ContainsPrize MyChoice, OpenedByOfficial)
F	F	0.66
F	T	0
T	F	0.33
T	T	0

In the initial choosing you have a 1/3 chance of guessing right. So there is a 2/3 chance of the prize being behind another door. When the official comes and opens one of the other doors the amount of doors which has a 2/3 chance of having the price behind them shrinks to 1. Therefore it is smart to switch.

You can imagine it this way: Say the prize is behind door 1. You choose door 1, the official opens door 2 and you switch to door 3. You loose. But if you had chosen either door 2 or 3 you would have switched to the right door. Therefore the likelihood of switching to the right door is 2/3.