hw 4

Yonghyun Kwon

1. (a)

(i) $T \to P \to \overset{\text{closed}}{D} \to B$: blocked

$T \to \overset{\text{closed}}{P} \to C \to S \to B$: blocked

$\Rightarrow \boxed{\text{True}}$

All of the two possible paths are blocked $\Rightarrow$ true

(ii) Consider a following path:

$A \to \overset{\text{open}}{T} \to \overset{\text{open}}{P} \to \overset{\text{open}}{D} \to B$: not blocked $\Rightarrow \boxed{\text{False}}$

(iii) Consider:

$A \to \overset{o}{T} \to \overset{o}{P} \to \overset{o}{C} \to \overset{o}{S} \to \overset{o}{B} \to D$: not blocked $\Rightarrow \boxed{\text{False}}$

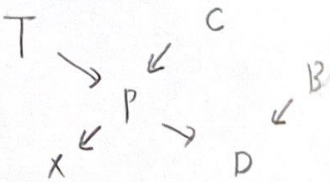
(iv) Consider:

$A \to \overset{o}{T} \to \overset{o}{P} \to C$: not blocked $\Rightarrow \boxed{\text{False}}$

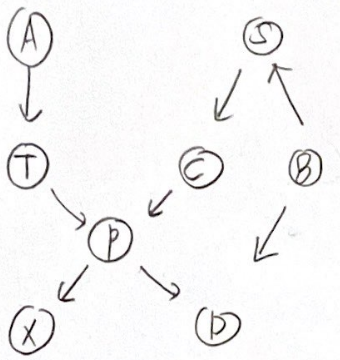
(b) $\mathbb{P}(a, s, t, c, p, b, x, d)$

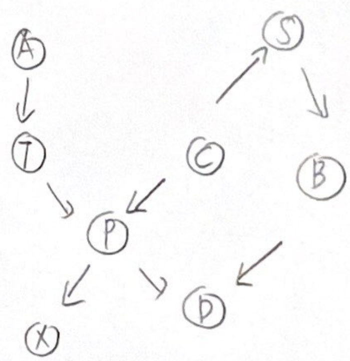
$= p(a) \cdot p(s)\, p(t|a)\, p(c|s)\, p(b|s)\, p(p|t,c)\, p(x|p)\, p(d|p,b)$

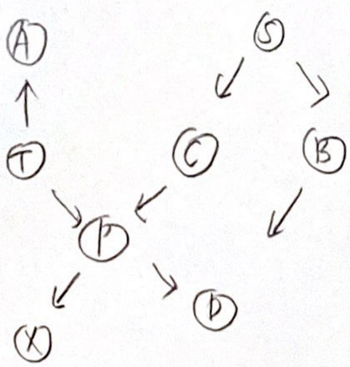
2. Note that the following directions do not change

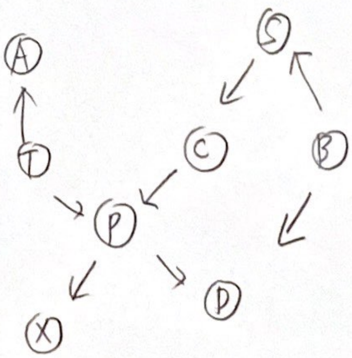


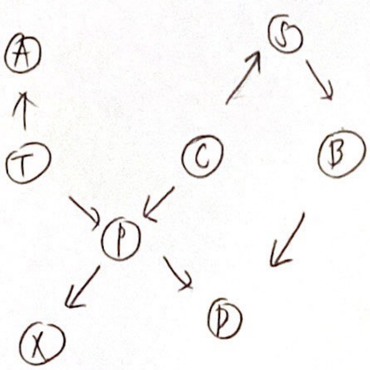
So all the possible independence equivalences are









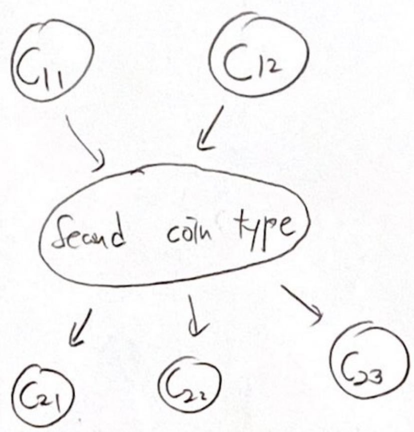


3. Jack flips a coin five times eventually.

Let C_{11}, C_{12} be the outcome of first two flips and

C_{21}, C_{22}, C_{23} be the outcome of last three flips.

Bayesian Network can be modeled as



We are interesting in finding MAP

$$C^* = \underset{\text{second coin type}}{\operatorname{argmax}}\ P(\text{second coin type} \mid C_{21} = T,\ C_{22} = H,\ C_{23} = T)$$

For instance, if $C^* = C_2$, we conclude that

first two flips came out the same.