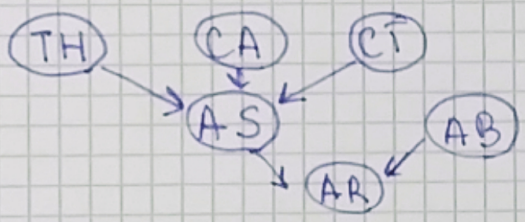
Bayes Networks

Alarm: · rings at the top of every hour.
· started by custodian.
· may be broken

Custodian: · may fall asleep.
· may go out to run quick errands

1. AR - alarm rings
TH - top of an hour
AS - alarm is started by ($AS = CA \wedge CT \wedge TH$)
AB - alarm is broken
CA - custodian aware
CT - custodian is there (not gone)

2. 

3. $P(\overline{AR}, \overline{AS}, \neg\overline{AB}) = x$ $\quad \overline{AR}$ means variable AR is true $\Leftrightarrow$ AR=T
$P(\overline{AR}, \overline{AS}, \overline{AB}) = y$ $\quad \neg\overline{AB} \Leftrightarrow$ AB=F

AS	AB	P(AR)	
0	0	0	if alarm is not broken and not started, it never rings
0	1	1-x-y	
1	0	x	if alarm is broken, it may ring regardless it is started or not
1	1	y	

4. if alarm is broken, it never rings.

AS	AB	P(AR)	
0	0	0	alarm rings only when started and not broken.
0	1	0	
1	0	1	
1	1	0	

5. $P(\overline{TH} \mid \neg\overline{AB}, \overline{CT}, \overline{CA}, \overline{AR}) = \alpha \sum_{AS} P(\overline{TH}, \overline{CT}, \overline{CA}, \neg\overline{AB}, \overline{AB}, AS)$

$= \alpha P(\neg\overline{AB}) P(\overline{TH}) P(\overline{CT}) P(\overline{CA}) \sum_{AS} P(AS \mid \overline{TH}, \overline{CA}, \overline{CT}) P(\overline{AR} \mid AS, \neg\overline{AB})$

as AS=T only when all TH, CA and CT are true (by def).
$\Rightarrow P(\overline{AS} \mid \overline{TH}, \overline{CA}, \overline{CT}) = 1$ and $P(\neg\overline{AS} \mid \overline{TH}, \overline{CA}, \overline{CT}) = 0$
$\Rightarrow P(AS \mid \overline{TH}, \overline{CA}, \overline{CT}) = 1$.

$= \alpha P(\neg\overline{AB}) P(\overline{TH}) P(\overline{CT}) P(\overline{CA})$ ~~$P(AS \mid TH)$~~, $P(\overline{AR} \mid \overline{AS}, \neg\overline{AB})$