The max-min-hill-climbing algorithm

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M.Sc. Comp. Science

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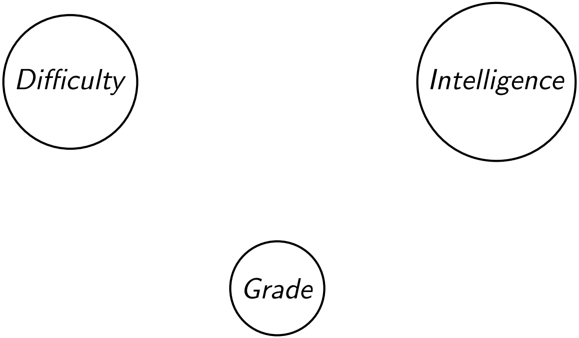
Difficulty
Intelligence
Grade

Definition (Conditional Independence)

Two variables X and Y are conditionally independent given $\mathbf{Z}$ w.r.t a probability distribution P, denoted as $Ind_p(X; Y|\mathbf{Z})$, if $\forall x, y, \mathbf{z}$, where $P(\mathbf{Z} = \mathbf{z}) > 0$,

$$P(X, Y|\mathbf{Z}) = P(X|\mathbf{Z}) * P(Y|\mathbf{Z}), \tag{1}$$

where $P(X, Y|\mathbf{Z}) = P(X \cap Y|\mathbf{Z})$.

It is equivalent

$$Ind(X; Y|\mathbf{Z}) \Longleftrightarrow (Assoc(X; Y|\mathbf{Z}) = 0), \tag{2}$$

where $Assoc(X; Y|\mathbf{Z})$ is the strength association (dependency) of X and Y given $\mathbf{Z}$.

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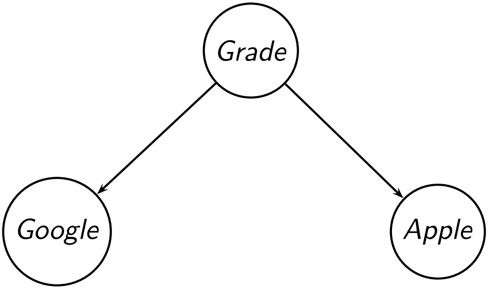
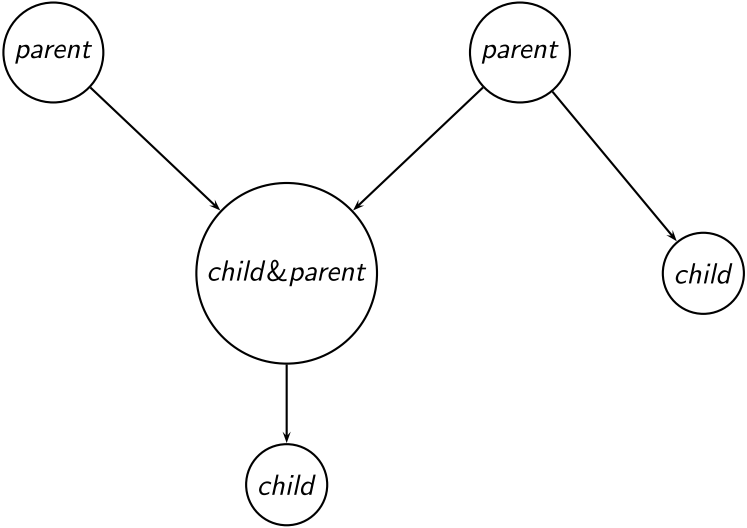

Grade
Google
Apple

Bayesian Networks

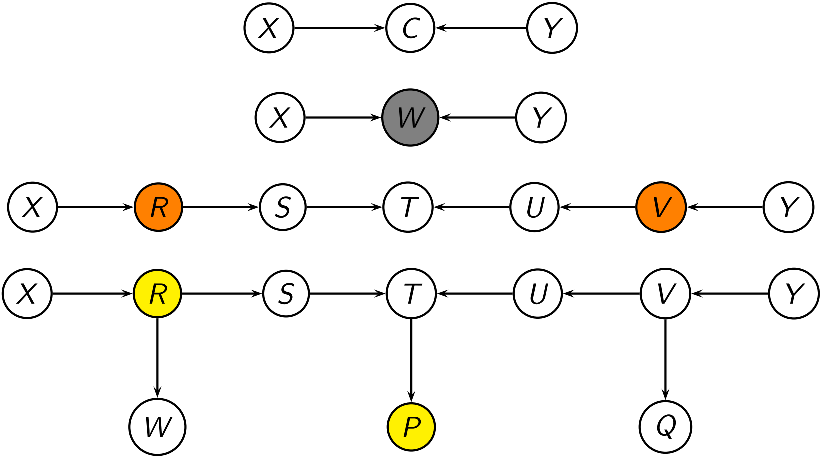


Blocked paths & d-seperation

Define three sets

Let A_1, A_2 and A_3 denote sets with:

$$\begin{aligned} A_1 &= \{W\} \\ A_2 &= \{R, V\} \\ A_3 &= \{R, P\} \end{aligned}$$


X
C
Y
X
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V
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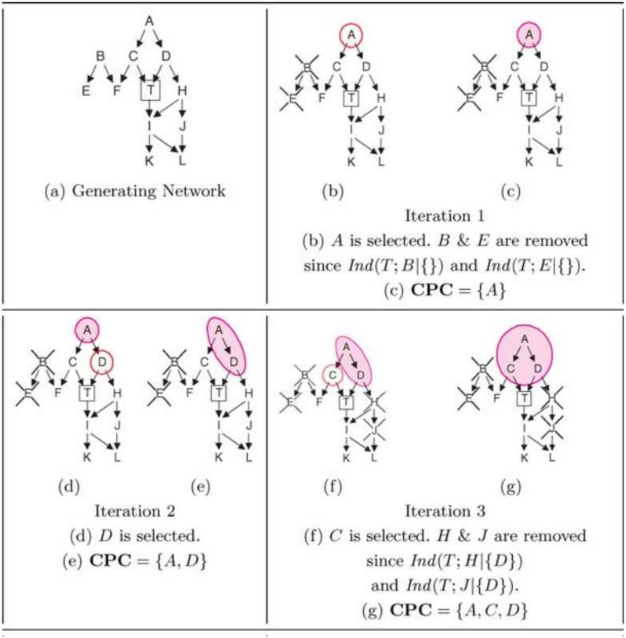


(a) Generating Network

(b) (c)

Iteration 1

(b) A is selected. B & E are removed since $Ind(T; B|\{\})$ and $Ind(T; E|\{\})$.

(c) **CPC** $= \{A\}$

(d) (e)

Iteration 2

(d) D is selected.

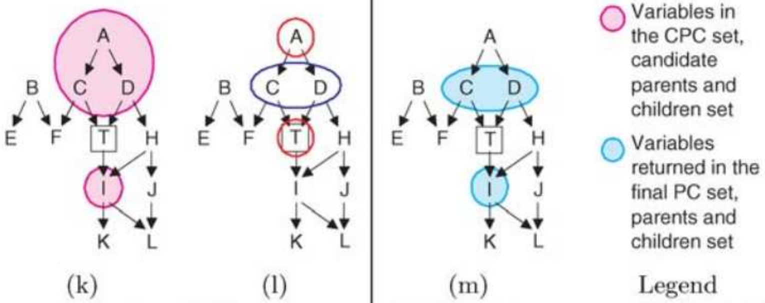
(e) **CPC** $= \{A, D\}$

(f) (g)

Iteration 3

(f) C is selected. H & J are removed since $Ind(T; H|\{D\})$ and $Ind(T; J|\{D\})$.

(g) **CPC** $= \{A, C, D\}$



Backward Phase

(l) $Ind(A; T|\{C, D\})$

(m) Final Outcome of $\overline{MMPC}$ (T)

Phase II: Backward Phase

Thanks for your attention!