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CSE - 576- Assignment-3

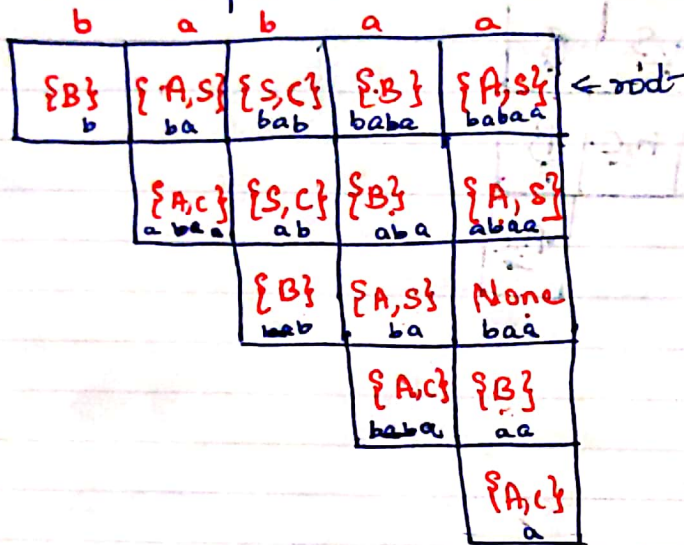
① Given

$$S \Rightarrow AB \mid BC$$

$$A \Rightarrow BA \mid a$$

$$B \Rightarrow CC \mid b$$

$$C \Rightarrow AB \mid a$$



The root contains the start 'S' symbol, Therefore the string "babaa" belong to the language of the above grammar, there exist a parse tree.

②

① Groundings of formula 1 are :

$$\begin{aligned} \text{Smoke}_1(A) &\Rightarrow \text{Cancer}(A) \\ \text{Smoke}_1(B) &\Rightarrow \text{Cancer}(B) \end{aligned}$$

(ii) Groundings of formula 2 are :

$\text{Friends}(A, A) \Rightarrow (\text{Smoker}(A) \Leftrightarrow \text{Smoker}(A))$
 $\text{Friends}(A, B) \Rightarrow (\text{Smoker}(A) \Leftrightarrow \text{Smoker}(B))$
 $\text{Friends}(B, A) \Rightarrow (\text{Smoker}(B) \Leftrightarrow \text{Smoker}(A))$
 $\text{Friends}(B, B) \Rightarrow (\text{Smoker}(B) \Leftrightarrow \text{Smoker}(B))$

(iii) The grounding formulas which are true in the World 1 are :

Formula 1 : $\text{Smokes}(A) \Rightarrow \text{Cancer}(A)$ is true.

Since both $\text{Smoker}(A)$ and $\text{Cancer}(A)$ are '1' ($1 \Rightarrow 1$) is True.

Similarly, $\text{Smoker}(B) \Rightarrow \text{Cancer}(B)$ is true.

Since both $\text{Smoker}(B)$ and $\text{Cancer}(B)$ are '0' ($0 \Rightarrow 0$) is True.

Formula 2 :

$\text{Friends}(A, A) \Rightarrow (\text{Smokes}(A) \Leftrightarrow \text{Smoker}(A))$ is True, since $(1 \Rightarrow (1 \Leftrightarrow 1))$ is True.

$\text{Friends}(B, B) \Rightarrow (\text{Smokes}(B) \Leftrightarrow \text{Smoker}(B))$ is True, since $(1 \Rightarrow (0 \Leftrightarrow 0))$ is True.

(iv) The grounding formulas which are true in the world 2 are

Formula 1 : $\text{Smoker}(B) \Rightarrow \text{Cancer}(B)$ is True, since $(0 \Rightarrow 0)$ is True.

Formula 2 : $\text{Friends}(A, A) \Rightarrow (\text{Smokes}(A) \Leftrightarrow \text{Smoker}(A))$ is True, since $1 \Rightarrow (1 \Leftrightarrow 1)$ is True.

$\text{Friends}(B, B) \Rightarrow (\text{Smokes}(B) \Leftrightarrow \text{Smoker}(B))$ is True, since $1 \Rightarrow (0 \Leftrightarrow 0)$ is True.

(v) Find $\frac{P(X = \text{World 1})}{P(X = \text{World 2})}$ let $n_1 = \text{formula 1}$
 $n_2 = \text{formula 2}$

$$P(X = \text{World 1}) = n_1(\text{World 1}) = 2, \omega_1 = 1.8$$

$$n_2(\text{World 2}) = 2, \omega_2 = 1.3$$

$$P(X = \text{World 1}) = \frac{1}{Z} \sum_{i=1}^2 \omega_i n_i(x)$$

$$= \frac{1}{Z} \exp\left(\sum_{i=1}^2 \omega_i n_i(x)\right) = \frac{1}{Z} e^{\sum_{i=1}^2 \omega_i n_i(x)}$$

$$= \frac{1}{Z} e^{1.8 \times 2 + 1.3 \times 2} = \frac{1}{Z} e^{3.6 + 2.6} = \frac{1}{Z} e^{6.2}$$

$$P(X = \text{World 2}) = \frac{1}{Z} e^{1.8 \times 1 + 1.3 \times 2}$$

$$n_1(\text{World 2}) = 1, n_2(\text{World 2}) = 2$$

$$\omega_1 = 1.8, \omega_2 = 1.3$$

$$= \frac{1}{Z} e^{1.8 + 2.6} = \frac{1}{Z} e^{4.4}$$

$$\frac{P(X = \text{World 1})}{P(X = \text{World 2})} = \frac{\frac{1}{Z} e^{6.2}}{\frac{1}{Z} e^{4.4}} = e^{1.8} = 6.05 // \text{Ans}$$

(i) Markov Network:

