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 CS4375.501

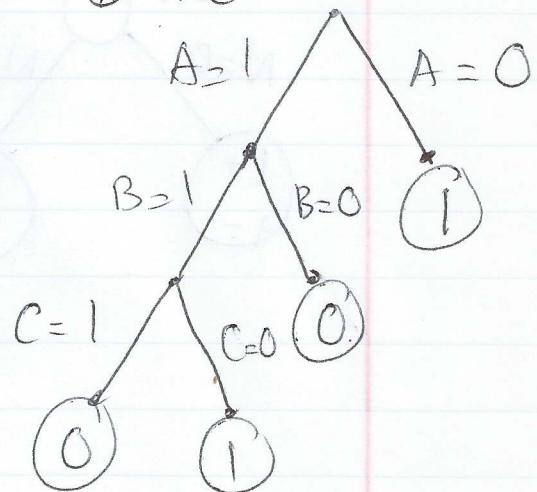
Homework 1 - Part I

1.

(a) \otimes Truth table

A B C	$(\neg A \vee B) \wedge \neg(C \wedge A)$
0 0 0	1
0 0 1	1
0 1 0	1
0 1 1	1
1 0 0	0
1 0 1	0
1 1 0	1
1 1 1	0

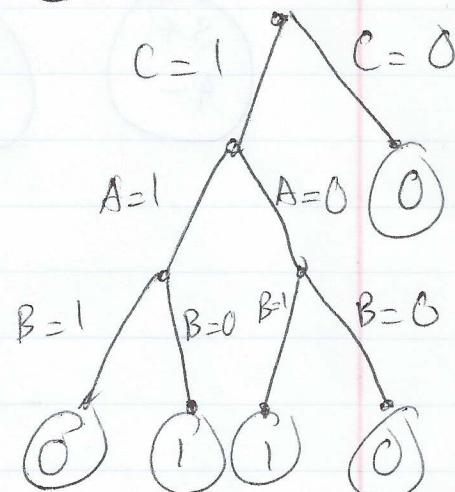
\otimes Tree



(b) \otimes Truth table

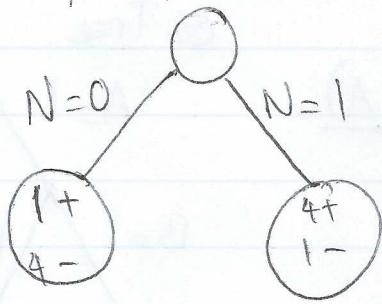
A B C	$(A \oplus B) \wedge C$
0 0 0	0
0 0 1	0
0 1 0	0
0 1 1	1
1 0 0	0
1 0 1	1
1 1 0	0
1 1 1	0

\otimes Tree



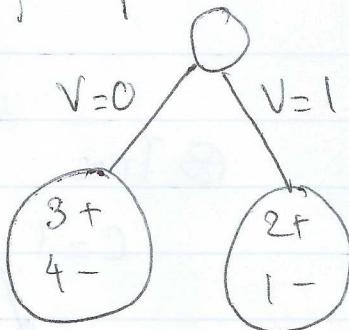
2. Root node S:  $H(S) = 1$

- If expand on Nigeria:



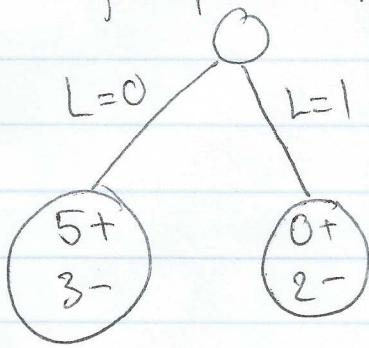
$$\begin{aligned}
 IG(S|N) &= H(S) - (H_{N=0}P_{N=0} + H_{N=1}P_{N=1}) \\
 &= 1 - \left[\left(-\frac{1}{5} \lg \frac{1}{5} - \frac{4}{5} \lg \frac{4}{5} \right) * \frac{1}{2} \right. \\
 &\quad \left. + \left(-\frac{4}{5} \lg \frac{4}{5} - \frac{1}{5} \lg \frac{1}{5} \right) \frac{1}{2} \right] \\
 &\approx 1 - .7219281 \\
 &= .278
 \end{aligned}$$

- If expand on viagra



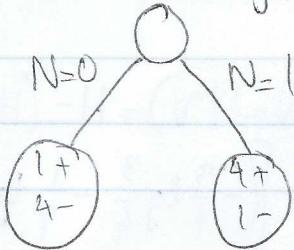
$$\begin{aligned}
 IG(S|V) &= H(S) - (H_{V=0}P_{V=0} + H_{V=1}P_{V=1}) \\
 &= 1 - \left[\left(-\frac{3}{7} \lg \frac{3}{7} - \frac{4}{7} \lg \frac{4}{7} \right) \frac{7}{10} \right. \\
 &\quad \left. + \left(-\frac{2}{3} \lg \frac{2}{3} - \frac{1}{3} \lg \frac{1}{3} \right) \frac{3}{10} \right] \\
 &\approx 1 - .965 \\
 &= .035
 \end{aligned}$$

- If expand on Learning:



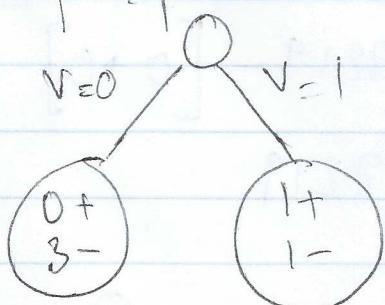
$$\begin{aligned}
 IG(S|L) &= H(S) - (H_{L=0}P_{L=0} + H_{L=1}P_{L=1}) \\
 &= 1 - \left[\left(-\frac{5}{8} \lg \frac{5}{8} - \frac{3}{8} \lg \frac{3}{8} \right) \frac{8}{10} + 0 \right] \\
 &\quad \cancel{+} = 1 - .7635 \\
 &= .2365
 \end{aligned}$$

\Rightarrow Choose Nigeria



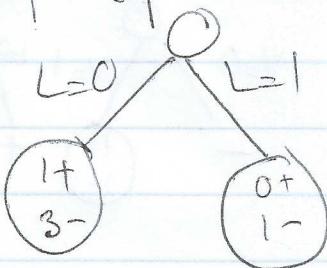
⊗ Left child (N=0): $H = .7219$

- If expand on viagra



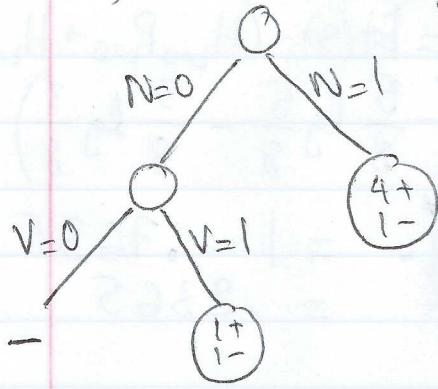
$$\begin{aligned}
 IG(N=0|V) &= H - (H_{V=0}P_{V=0} + H_{V=1}P_{V=1}) \\
 &= .7219 - \left[0 + (1) \left(\frac{2}{5} \right) \right] \\
 &= .3219
 \end{aligned}$$

- If expand on learning



$$\begin{aligned}
 IG(N=0|L) &= H - (H_{L=0}P_{L=0} + H_{L=1}P_{L=1}) \\
 &= .7219 - \left[\left(-\frac{1}{4} \lg \frac{1}{4} - \frac{3}{4} \lg \frac{3}{4} \right) \frac{4}{5} + 0 \right] \\
 &= .0729
 \end{aligned}$$

\Rightarrow Choose viagra



\otimes Right child ($N=1$) $H = .7219$

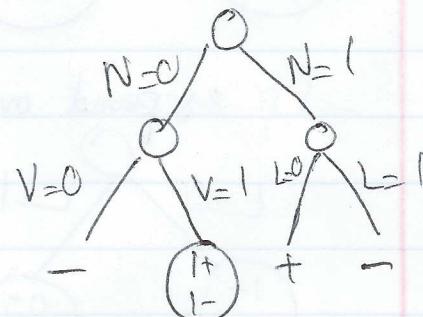
- If expand on viagra: $IG(N=1|V) = H - (H_{V=0} P_{V=0} + H_{V=1} P_{V=1})$

$$= .7219 - \left[\left(-\frac{3}{4} \log \frac{3}{4} - \frac{1}{4} \log \frac{1}{4} \right) \frac{4}{5} + 0 \right] \\ = .0729$$

- If expand on learning: $IG(N=1|L) = H - (H_{L=0} P_{L=0} + H_{L=1} P_{L=1})$

$$= .7219 - [0 + 0] \\ = .7219$$

\Rightarrow Choose learning



(*) Right child ($V=1$) : expand on learning

