5/10/21

DWDM

Tutorial-6

u18co021 - Sahil Bondre

Q1 $\text{Sensitivity} = \frac{TP}{TP + FN}$

$\text{Specificity} = \frac{TN}{TN + FP}$

$\text{Accuracy} = \frac{TP + TN}{TP + FN + FP + TN}$

$P = \frac{TP + FN}{TP + FN + FP + TN}$

$1 - P = \frac{FP + TN}{TP + FN + FP + TN}$

$= \text{Sensitivity} \cdot P + \text{Specificity} \cdot (1 - P)$

$= \frac{TP}{TP + FN + FP + TN} + \frac{TN}{TP + FN + FP + TN}$

$= \text{Accuracy}$

$\therefore Acc = f(\text{Specificity}, \text{Sensitivity})$

Q2	MP		WP		CI			G	
	Y	N	Y	N	Y	N		Y	N
LIP	~~5~~ 5	~~2~~ 3	4	0	3	0	M	2	4
Y							F	1	3
N	0	3	1	5	2	5	Ratio M	0.6	
RatioY	0.7		0.4		0.3		Ratio F	0.4	
RatioN	0	3	0.6		0.7				

a $X = \{MP = Y \wedge WP = Y \wedge CI = N \wedge G = F\}$

i $P(LIP = Y \mid X) = \dfrac{P(X \mid LIP = Y) \cdot P(LIP = Y)}{P(X)}$

$= \dfrac{1 \cdot 0.8 \cdot 0.4 \cdot 0.33 \cdot 0.5}{0.7 \cdot 0.4 \cdot 0.7 \cdot 0.4} = \dfrac{0.0528}{0.0784}$

$= 0.6735$

ii $P(LIP = N \mid X) = \dfrac{P(X \mid LIP = N) \cdot P(LIP = N)}{P(X)}$

$= \dfrac{0 \times 0.5}{0.6784} = 0$

$\therefore LIP = \text{"Yes"}$

b $X = \{MP = Y, AWP = Y \wedge CI = N\}$

i $P(LIP = Y \mid X) = \dfrac{P(X \mid LIP = Y) \cdot P(LIP = Y)}{P(X)}$

$= \dfrac{1 \cdot 0.8 \cdot 0.4 \cdot 0.5}{0.7 \cdot 0.4 \cdot 0.7}$

$= 0.816$

ii $P(LIP = N \mid X) = \dfrac{P(X \mid LIP = N) \cdot P(LIP = N)}{P(X)}$

$= 0$ [as before]

$\therefore LIP =$ "Yes"

Q3 $E(S) = -\frac{4}{10}\log(0.4) - \frac{3}{10}\log(0.3) \times 2$

$= 1.571$

$E(C, S) = -\frac{5}{10}(0.6 \log 0.6 + 0.2 \log 0.2 \times 2)$

$-\frac{5}{10}(0.2 \log 0.2 + 2 \times 0.4 \log 0.4)$

$= 1.4465$

$\therefore$ Gain $(G, S) = E(S) - E(G, S)$

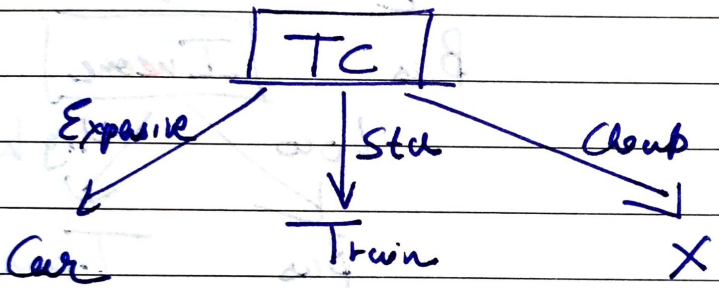
$= 0.1245$

Similarly:

$\text{Gain}(T, S) = 1.215 \rightarrow$ Highest

$\text{Gain}(C, S) = 0.540$

$\text{Gain}(I, S) = 0.689$



$E(S) = -0.8 \log 0.8 + 0.2 \log 0.2$

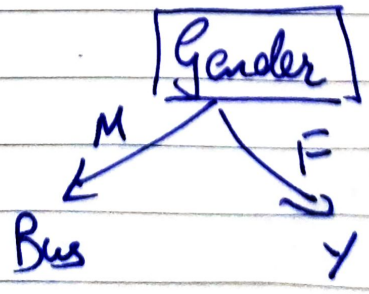
$= 0.722$

$\text{Gain}(G, S) = 0.328 \rightarrow$ Highest

$\text{Gain}(C, S) = 0.168$

$\text{Gain}(I, S) = 0.170$

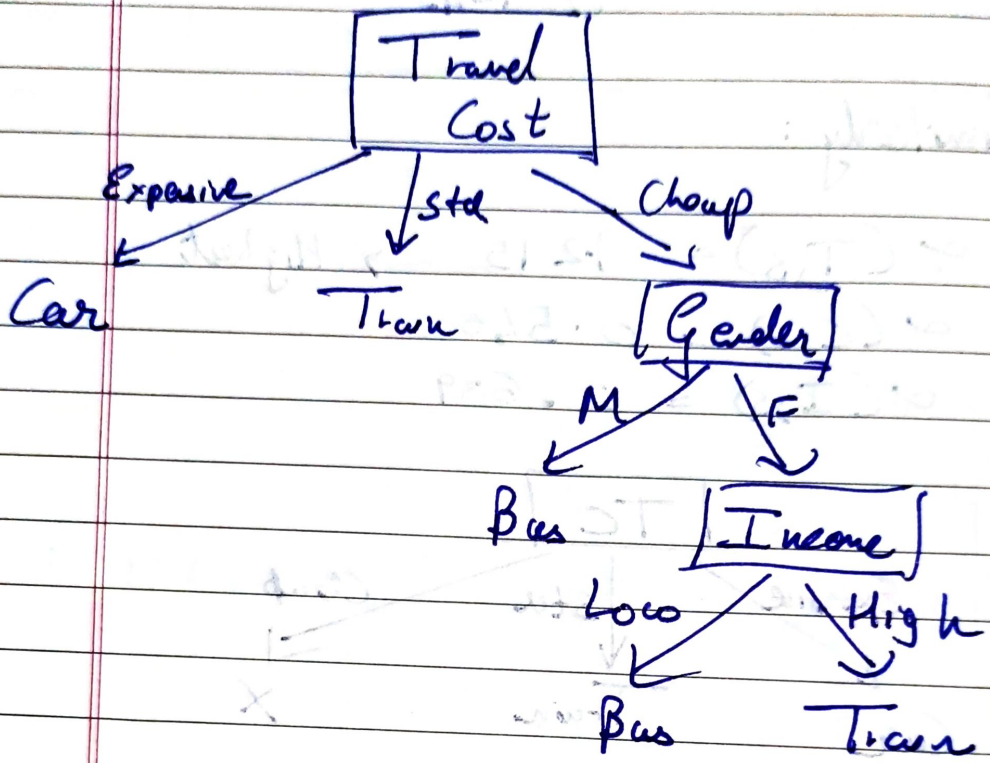
$\therefore$ X subtree:



Y data:

C	I	M	
0	L	Bus	[Choose Any]
1	H	Train	

Final Tree:



∴ P(Female, 2, std, high) = Train