North South University
Department of Electrical & Computer Engineering

CSE 445

Section:4

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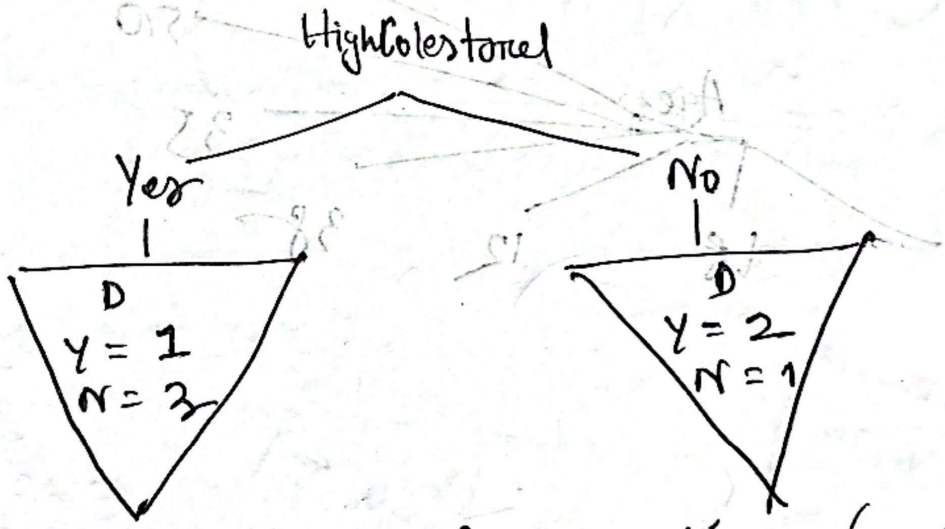
High Colestorel	Regular Excercise	Age	Diabates
Y	Y	8	0
Y	N	18	0
N	Y	12	1
N	Y	38	1
Y	Y	35	1
Y	N	50	0
N	N	83	0



Right impurity: $1 - \left(\frac{1}{1+3}\right)^2 - \left(\frac{3}{1+3}\right)^2$

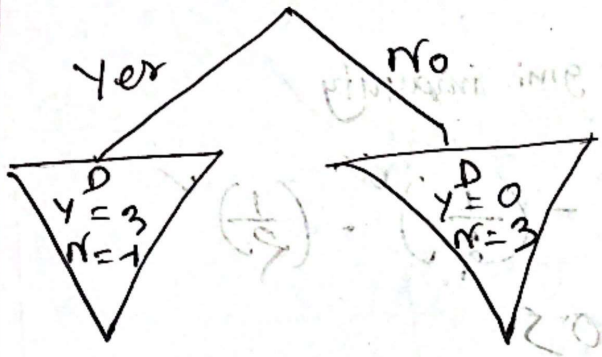
$= 0.375$

left impurity: $1 - \left(\frac{2}{2+1}\right)^2 - \left(\frac{1}{2+1}\right)^2$

$= 0.44$

$cf = \left(\frac{4}{4+3}\right) \times 0.375 + \left(\frac{3}{4+3}\right) \times 0.44 = 0.40$

Regular Excercise



Left impurity = $1 - \left(\frac{3}{3+1}\right)^2 - \left(\frac{1}{3+1}\right)^2$

$= 0.325$

Right impurity = $1 - \left(\frac{0}{3+0}\right)^2 - \left(\frac{3}{3+0}\right)^2$

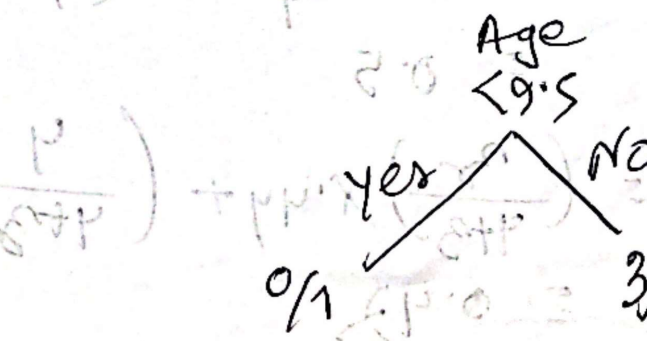
$= 0$

cost function = $\left(\frac{4}{3+4}\right) \times 0.325$

$= 0.214$

Age

Dia	0	1	0	1	1	0	0	Sorted values
Age	2	12	18	35	38	50	83	
Split	9.5	15	26.5	36.5	44	66.5		Average

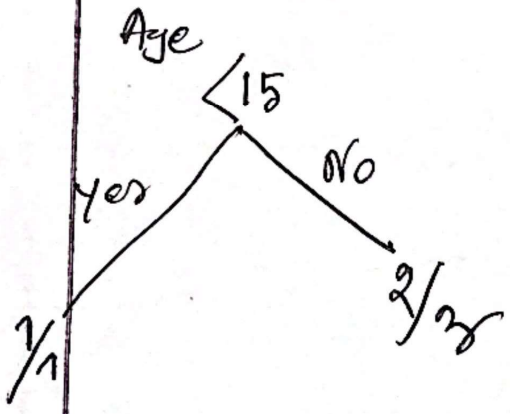


Left gini = 0

Right gini = $1 - \left(\frac{3}{6}\right)^2 - \left(\frac{3}{6}\right)^2$

$= 0.5$

cost f. = $\left(\frac{3}{2} \times 0.5\right) = 0.21$



Left gini impurity

$= 1 - \left(\frac{1}{1}\right)^2 - \left(\frac{1}{1}\right)^2$

$= 0.5$

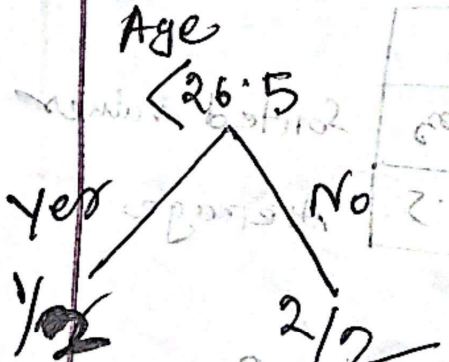
Right gini impurity

$= 1 - \left(\frac{2}{5}\right)^2 - \left(\frac{3}{5}\right)^2$

$= 0.48$

cost function $= \left(\frac{2}{2+5}\right) \times 0.5 + \left(\frac{5}{2+5}\right) \times 0.4$

$= 0.48$



Left gini $= 1 - \left(\frac{1}{3}\right)^2 - \left(\frac{2}{3}\right)^2$

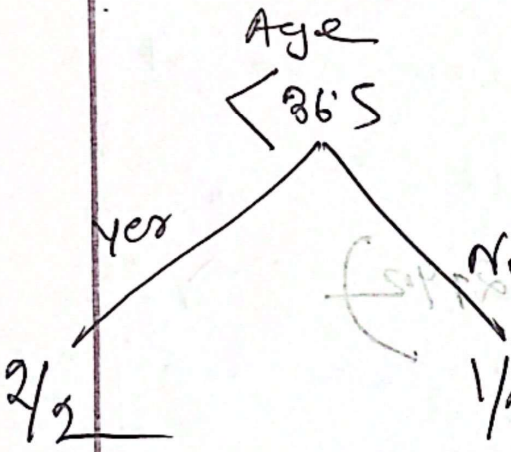
$= 0.44$

Right gini $= 1 - \left(\frac{2}{4}\right)^2 - \left(\frac{2}{4}\right)^2$

$= 0.5$

cost fun $= \left(\frac{3}{4+3}\right) \times 0.44 + \left(\frac{4}{4+3}\right)$

$= 0.42$



$$Left = 1 - \left(\frac{2}{4}\right)^2 - \left(\frac{2}{4}\right)^2$$

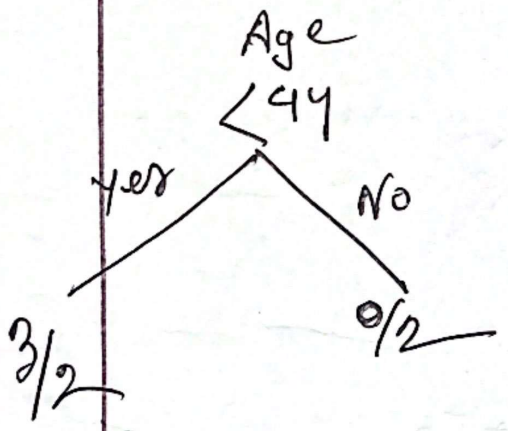
$$= 0.5$$

$$Right = 1 - \left(\frac{1}{3}\right)^2 - \left(\frac{2}{3}\right)^2$$

$$= 0.44$$

$$cost f = \left(\frac{4}{7}\right) \times 0.5 + \left(\frac{3}{7}\right) 0.44$$

$$= 0.42$$



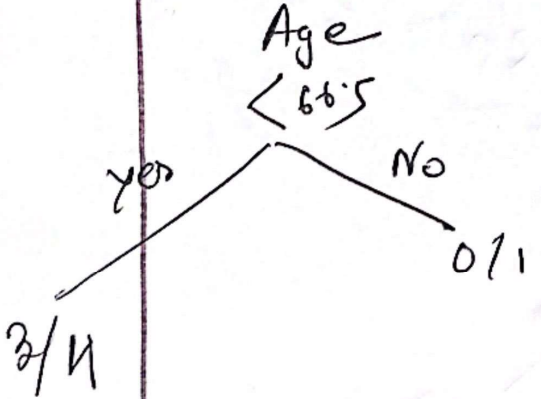
$$Left = 1 - \left(\frac{3}{5}\right)^2 \phi - \left(\frac{2}{5}\right)^2$$

$$= 0.48$$

$$Right = 0$$

$$cf = \left(\frac{5}{7}\right) \times 0.48$$

$$= 0.34$$



$$Left = 1 - \left(\frac{3}{7}\right)^2 - \left(\frac{4}{7}\right)^2$$

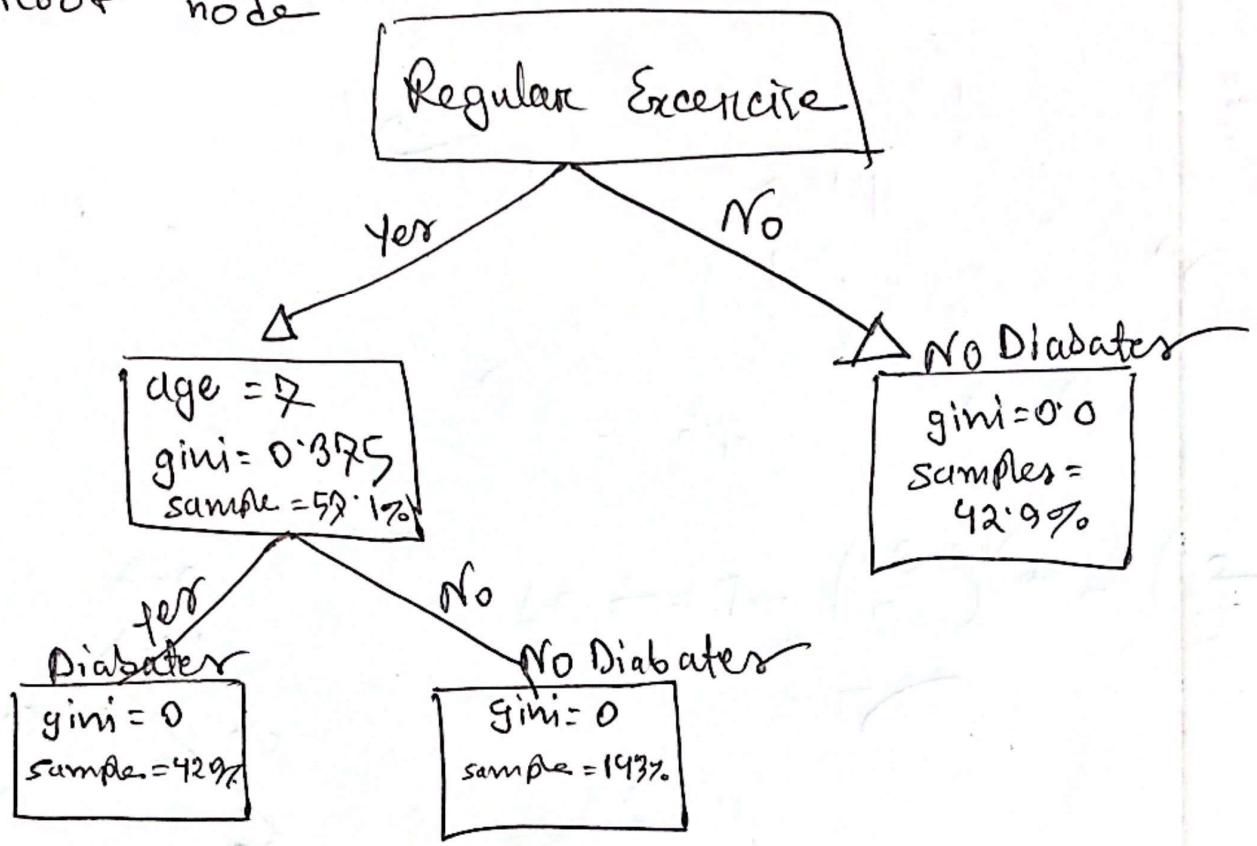
$$= 0.48$$

$$Right = 0$$

$$cf = \left(\frac{7}{8}\right) \times 0.48$$

$$= 0.42$$

We got Regular excercise as lowest cost function so it will be the root node



Final decision tree

Generated DT From Colab
Link: https://cutt.ly/v02n1mm