

LMT

(LAST MOMENT TUITIONS)

A FREE ONLINE
LAST MOMENT FRIEND

NOTES

→ LAST MOMENT TUITIONS

is a youtube channel which makes complicated stuff easy
aur last moment pe pass kaise hona hai uska apko jugaad yehi jaroor milenga

Note: Pehle youtube pe Hamare videos dekhlo Phir NOTES Bahut achese apko samjhenge



NOTES FROM

Last Moment Tuitions

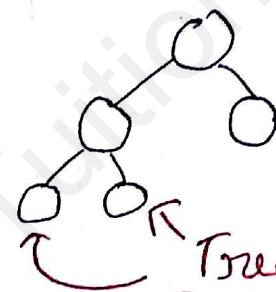
Decision tree notes

Age	competition	Type	Profit
old	Yes	Software	Down
old	No	Software	Down
old	No	Hardware	Down
mid	Yes	Software	Down
mid	Yes	Hardware	Down
mid	No	Hardware	Up
mid	No	Software	Up
new	Yes	Software	Up
new	No	Hardware	Up
new	No	Software	Up

Draw a decision tree for given datasets?
yeh question us university exam me 10marks
ke liye Pucha gaya tha

Let See how to solve this

- Dekh bhai koi bhi dataset ya Table diya ho uska jo last column hota hai na voh hota hai class ATTRIBUTE
- jaise apne table me PROFIT hai aur uski jo value rahengi voh honge mere leaf node



Tree ke
jo last wale
node ko leaf node
kہتا ہے

Given question me Decision tree isliye
Pucha hai meko aise decision tree banake
jo jisse Pata chali mera Profit
UP and down kaise honge.

$$I(P_i, N_i) = \frac{-P}{P+N} \log_2 \left(\frac{P}{P+N} \right) - \frac{N}{P+N} \log_2 \left(\frac{N}{P+N} \right)$$

$$P=0, N=3.$$

$$I(P_i, N_i) = \frac{0}{0+3} \log_2 \left(\frac{0}{0+3} \right) - \frac{3}{0+3} \log_2 \left(\frac{3}{0+3} \right)$$

(Dekh bhai jab P ya N dono me se ek bhi value 0 hai toh answer bhi 0 hi hoga)

$$I(P_i, N_i) = 0$$

similarly you find for

$$P=2, N=2$$

$$I(P_i, N_i) = \frac{-2}{4} \log_2 \left(\frac{2}{4} \right) - \frac{2}{4} \log_2 \left(\frac{2}{4} \right)$$

(When $P=N=2$ then entropy will be 1)

$$I(P_i, N_i)_{\text{mid}} = 1$$

//

$$P=3, N=6$$

$$I(P_i, N_i) = 0_{\text{--}}$$

New

∴ Entropy of Age

$$= \frac{\sum P_i + N_i}{P+N} I(P_i, N_i)$$

yeh P and N class
attribute ki value hai
where $P=5, N=5$

$$= \frac{0+3}{10}(0) + \frac{2+2}{10}(1) + \frac{3+0}{10}(0)$$

$$= \frac{4}{10} = 0.4$$

∴ Gain = Entropy - Entropy of Age

class

$$= 1 - 0.4 \quad (\text{yeh jo humne starting Pe}\newline \text{Profit ki entropy nikali thi}\newline \text{voh hai})$$

Step 1:

In Profit

ut

$$\text{class } P = \text{Profit (up)} = 5$$

$$\text{class } N = \text{Profit (down)} = 5$$

(Toh hamne class attribute hai Profit usko entropy nikalna hai)

$$\text{Entropy}(P, N) =$$

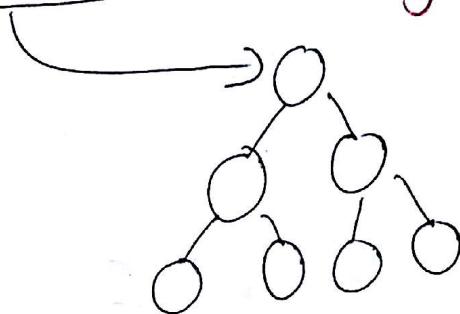
$$\frac{-P}{P+N} \log_2 \left(\frac{P}{P+N} \right) - \frac{N}{P+N} \log_2 \left(\frac{N}{P+N} \right)$$

after putting value of $P=5$, $N=5$ aur
get

$$= \frac{-5}{10} \log_2 \left(\frac{5}{10} \right) - \frac{5}{10} \log_2 \left(\frac{5}{10} \right)$$

$$\begin{aligned} \text{Entropy} &= \\ (\text{Profit}) &\neq \end{aligned}$$

chalo itna Pata chal gaya ki up and down
 mere leaf node honge so questions
 comes root node kyun honga



To find this hum saare column ka
 gain nikalenge aur compare karenge
 jiska gain sabse zyaada bad roh root node

For Age	P_i	N_i	$I(P_i, N_i)$
old	0	3	0
mid	2	2	1
new	3	0	0

Now for
Competition

	P_i	N_i	$I(P_i, N_i)$
Yes	1	3	0.81127
No	4	2	

$$I(P_i, N_i) = \frac{-1}{4} \log_2\left(\frac{1}{4}\right) - \frac{3}{4} \log_2\left(\frac{3}{4}\right)$$

Yes

$$= 0.81127$$

$$I(P_i, N_i) = \frac{-4}{6} \log_2\left(\frac{4}{6}\right) - \frac{2}{6} \log_2\left(\frac{2}{6}\right)$$

No

$$= 0.918295$$

Entropy (competition)

$$= \sum_{P+N} P_i + N_i (I(P_i, N_i))$$

$$= \frac{(1+3)}{10} (0.81127) + \frac{(4+2)}{5+5} (0.918295)$$

$$= 0.8754$$

Date

Gain = class - Entropy (competition)

Entropy

$$= 1 - 0.8754$$

$$= 0.124515$$

for Type

	P_i	N_i	$I(P_i, N_i)$
Software	3	3	1
hardware	2	2	1

$$I(P_i, N_i) = 1 \quad \because \text{because } P=N$$

Software

$$I(P_i, N_i) = 1$$

Hardware

Entropy (Type)

$$= \frac{3+3}{5+5} (1) + \frac{(2+2)}{5+5} (1)$$

$$= \frac{6}{10} + \frac{4}{10} = \frac{10}{10} = 1$$

Gain = class entropy - Entropy (Type)

$$= 1 - 1$$

$$= 0$$

Information Gain

Age

0.6 ← root node

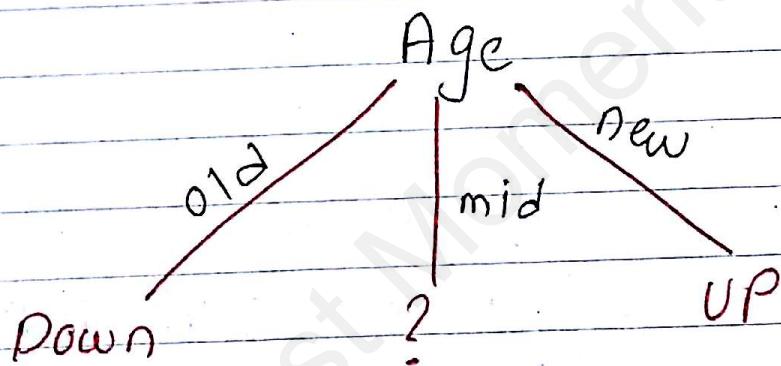
Competition

0.124515

Type

O

- Toh gain sabse zyaada age ka hai
root node will be age
- Ab AGE me jitni bhi value hai us
utne root node se branches niklengen



Agar apne Age old ki values and Profit ki values ko compare kare toh sab value down hai direct down likh do same for new

Age	Profit
old	→ Down
old	→ Down
old	→ Down

Age	Profit
new	→ UP
new	→ UP
new	→ UP

But MID me up and down dono values
 isliye Hum direct kuch Pub nahi kar sakte
 so hamse firse sirf mid ka table banana
 Padunga

Age	Competition	Type	Profit
mid	Yes	Software	Down
mid	Yes	Hardware	Down
mid	No	Hardware	Up
mid	No	Software	Up

Ab same Process firse karna hai
 class attribute ki entropy nikalni hai
 and Competition and Type ka gain nikalte
 jo bada honga usko mid ka node
 banana hai

$$\text{class } P = \text{Profit(Up)} = 2$$

$$\text{class } N = \text{Profit(Down)} = 2.$$

$$\text{Entropy(Profit)} = 1$$

$$\therefore (P=N)$$

Now let's find gain for Competition

Competition

	P_i	N_i	$I(P_i, N_i)$
Yes	0	2	0
NO	0	2	0

$$I(P_i, N_i) = 0 \\ (\text{Yes})$$

$$I(P_i, N_i) = 0 \\ (\text{No})$$

(Koi bhi ek value P or N me 0 hai toh
ast answer will be zero)

Entropy (competition)

$$= \frac{2}{4}(0) + \frac{2}{4}(0) = 0$$

$$\text{Gain} = \text{Entropy}_{\text{class}} - \text{Entropy}_{(\text{competition})}$$

$$= 1 - 0$$

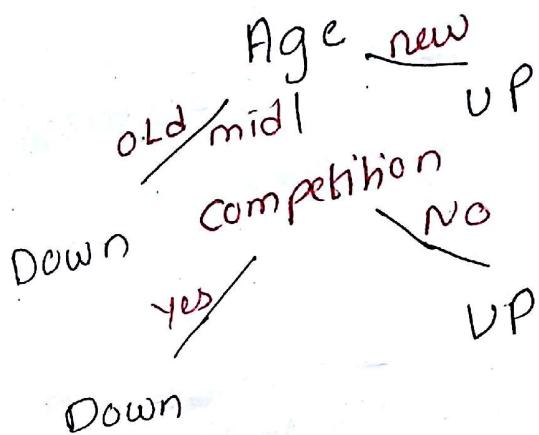
$$= 1$$

Gain
competition

→

1
0

Type



obviously apko doubt aya honga ki
yaar fir Type kaha gaya competition (yes) ki and
dekh bhai jab mai compare kar raha hu toh
Profit ki value compare kar raha hu toh
I'm Getting direct answer down
Type ka zhangab Kya Palneko
similarly for NO = VP

competition Profit
Yes → Down
Yes → Down

competition Profit
No → VP
No → VP

Toh agar app decision tree ko analyse karo toh we can see ki agar hum new person rakte hai and voh age me jawan hai toh Profit UP and budha hai jyekn Profit down

Agar age mid hai toh dekhne ka competition kitna hai if Yes @ Toh Profit → down if NO toh Profit → UP

Toh iss tarah se real life me decision tree kaam karta hai.

Note: Exams me sab likne ki jarurat nahi hai sirf jo ka calculation voh likhna hai baki apke understanding purpose ke liye hai.

Thank you so much to study from last moment tuitions.

and please let us know if we can add some help to you from last moment tuitions aur ha

Whatsapp pe share karna plz.

sirf

exams ke liye

for

only exams notes.

Age	Competition	Type	Profit
Old	Yes	Software	Down
old	No	Software	Down
old	No	Hardware	Down
mid	Yes	Software	Down
mid	Yes	Hardware	Down
mid	No	Hardware	Vp
mid	No	Software	Vp
new	Yes	software	Vp
new	No	Hardware	Vp
new	No	Software	Vp

Entrophy (class)

$$= \frac{-P}{P+N} \log_2 \left(\frac{P}{P+N} \right) - \frac{N}{P+N} \log_2 \left(\frac{N}{P+N} \right)$$

For each attribute

$$I(P_i, N_i) = \frac{-P}{P+N} \log_2 \left(\frac{P}{P+N} \right) - \frac{N}{P+N} \log_2 \left(\frac{N}{P+N} \right)$$

Entrophy (attribute)

$$= \frac{\sum P_i + N_i}{P+N} (I(P_i, N_i))$$

Gain

$$= \text{Entrophy}_{\text{Class}} - \text{Entrophy}_{\text{attribute}}$$

Age

Age	P _i	N _i	I(P _i , N _i)
Old	0	3	0
Mid	2	2	1
New	3	0	0

$$I(P_i, N_i) = \frac{-P}{P+N} \log_2 \left(\frac{P}{P+N} \right) - \frac{N}{P+N} \log_2 \left(\frac{N}{P+N} \right)$$

Entropy of Age

$$= \sum \frac{P_i + N_i}{P+N} I(P_i, N_i)$$

$$= 0.4$$

$$\text{Gain} = \frac{\text{Class entropy}}{\text{entropy}} - \text{Entropy (Age)}$$

$$= 1 - 0.4 = 0.6$$

Competition

	P_i	N_i	$I(P_i, N_i)$
Yes	1	3	0.81127
No	4	2	0.918295

$$I(P_i, N_i) = 0.81127$$

Yes

$$I(P_i, N_i) = 0.918295$$

No

Entropy (Competition)

$$= \frac{(1+3)}{5+5} (0.81127) + \frac{(4+2)}{5+5} (0.918295)$$

$$= 0.8754$$

$$\text{Gain} = \frac{\text{Class Entropy}}{\text{Entrophy}} - \text{Entropy (competition)}$$

$$= 1 - 0.8754$$

$$= 0.124515$$

Type

	P_i	N_i	$I(P_i, N_i)$
Software	3	3	1
Hardware	2	2	1

$$\text{Entropy}_{(\text{Software})} = \frac{I_9}{10} = 1$$

$$\text{Entropy}_{(\text{Hardware})} = \frac{I_9}{10} = 1$$

Entropy (Type)

$$= \frac{3+3}{5+5} (1) + \frac{(2+2)}{(5+5)} (1)$$

$$= \frac{6}{10} + \frac{4}{10} = \frac{10}{10} = 1$$

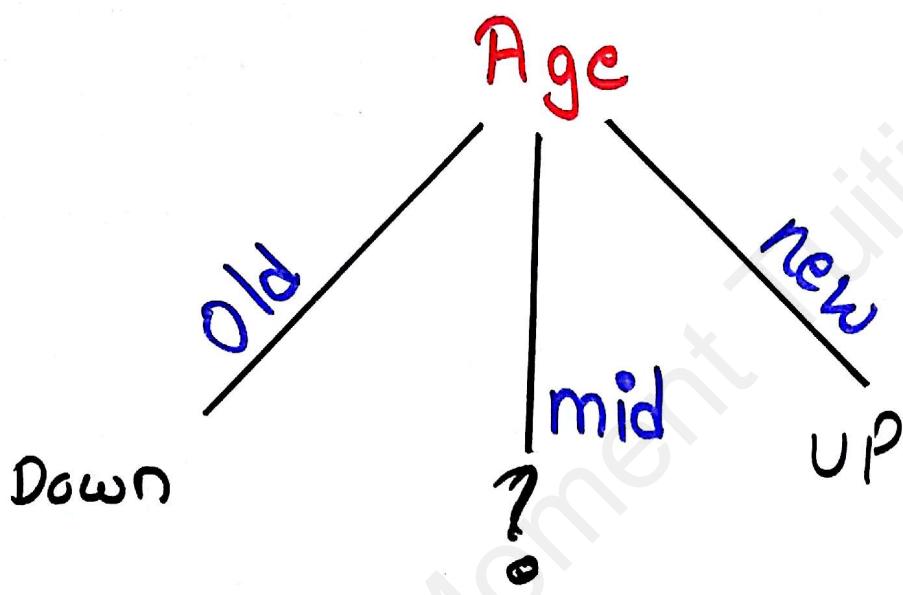
$$\text{Gain} = \underline{\text{Class entropy}} - \text{Entropy (Type)}$$

$$= 1 - 1$$

$$= 0$$

Information Gain

Age	0.6	← node
Competition	0.124515	
Type	0	



Age Profit

old → Down

old → Down

old → Down

Age Profit

new → Up

new → Up

new → Up

Age	Competition	Type	Profit
mid	Yes	Software	Down
mid	Yes	Hardware	Down
mid	No	Hardware	Up
mid	No	Software	Up

$$P=2, N=2$$

$$\text{Entropy (Profit)} = 1$$

Competition

	P_i	N_i	$I(P_i, N_i)$
Yes	0	2	0
No	2	0	0

$$I(P_i, N_i) = 0 \\ (\text{Yes})$$

$$I(P_i, N_i) = 0 \\ (\text{No})$$

Entropy (competition)

$$= \frac{2}{4} (0) + \frac{2}{4} (0) = 0$$

$$\text{Gain} = \text{Entropy}_{\text{Class}} - \text{Entropy}_{(\text{competition})}$$

$$= 1 - 0$$

$$= 1 \approx$$

Type

	P_i	N_i	$I(P_i, N_i)$
Software	1	1	1
Hardware	1	1	1

- ~~Entropy~~^{IG} (Software) = 1

- ~~Entropy~~^{IG} (Hardware) = 1

Entropy (Type)

$$= \frac{2}{4} (1) + \frac{2}{4} (1) = \frac{2}{4} + \frac{2}{4}$$

$$= \frac{4}{4} = 1$$

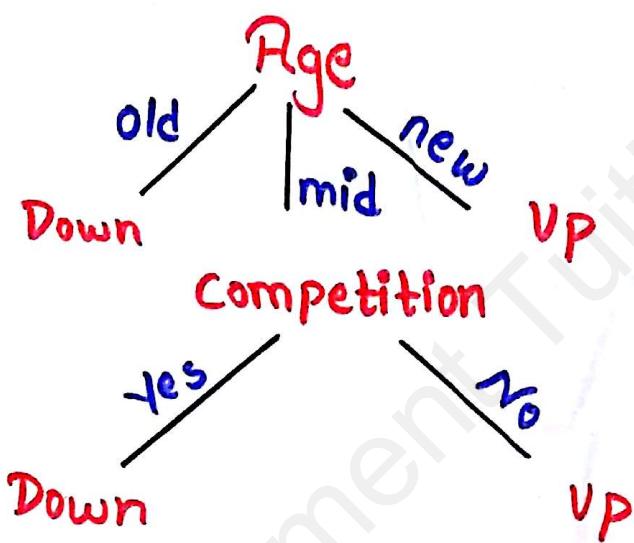
$$\text{Gain}_{\text{class}} = \text{Entropy}_{\text{class}} - \text{Entropy}(\text{Type})$$

$$= 1 - 1$$

$$= 0$$

Gain

Competition	$I \leftarrow \text{node}$
Type	O



Competition Profit

Yes \rightarrow Down

Yes \rightarrow Down

Competition Profit

No \rightarrow Up

No \rightarrow UD

THANK YOU SO MUCH
TO SEE THE VIDEOS
AND NOTES

IF YOU HAVE ANY DOUBT

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AND PLEASE APNE LAST MOMENT
KE FRIENDS KO VIDEO AND
NOTES SHARE KARO,