Time	Match-type		
Morning	Mastee	Grass	F
Afternoon	Grand-slam	clay	F
Night	Friendly	Hard	F
Afternoon	Friendly	Mixed	N
Afternoon	Mastee	clay	N
Afternoon	Grand-slam	Grass	F
Afternoon	Grand-slam	Hard	F
Afternoon	Grand-slam	Hard	F
Morning	Mastee	Grass	F
Afternoon	Grand_slam	clay	N
Night	Friendly	Hard	F
Night	Mastee	Mixed	N
Afternoon	Mastee	Mclay	N
Afternoon	Mastee	Grass	F
Afternoon	Grand_slam	Hard	F
Afternoon	Grand-slam	clay	F

M=

M=2

F2

11

5

16

16

Total element = 16

F = 11

N = 5

entropy for entire dataset =

$$E(S) = -\left(\frac{11}{16}\log\frac{11}{16}\right) - \left(\frac{5}{16}\log\frac{5}{16}\right)$$

$$= -(0.6875)(-0.5406) - (0.3125)(-1.6782)$$

~~0.371~~

$= $ ~~0.3672 + 1.4407~~

$E(S) = 0.3716 + 0.5244 = \boxed{0.8960}$

- Spliting dataset on ~~Time~~ :-

Time	Match_type	Court_surface	outcome
Morning	Master	Grass	F
Morning	Master	Grass	F

Total element = 2

F = 2 N = 0

entropy of time morning =

$$= -\left(\frac{2}{2}\right)\left(\log\frac{2}{2}\right) - \left(\frac{0}{2}\right)\left(\log\frac{0}{2}\right)$$

$= 0$

- Spliting dataset on ~~Afternoon~~ Night :-

Time	Match-type	Court_surface	outcome
Night	Friendly	Hard	F
Night	Friendly		F
Night	Master		N

Total = 3

F = 2 N = 1

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

0.3953

~~0.4286~~

0.5276

$= (-0.66)(-0.599)(-0.33)(-1.599) = 0.9199$

Time	Mash-type	court_surface	outcome
noon	Grand-slam	clay	F
noon	Friendly	Mixed	N
noon	Mastee	clay	N
Noon	Grand-slam	Grass	F
noon	Grand-slam	Hard	F
noon	Grand-slam	Hard	F
noon	Grand-slam	clay	N
noon	Mastee	clay	N
noon	Mastee	Grass	F
noon	Grand-slam	Hard	F
noon	Grand-slam	clay	F

Total element = 11

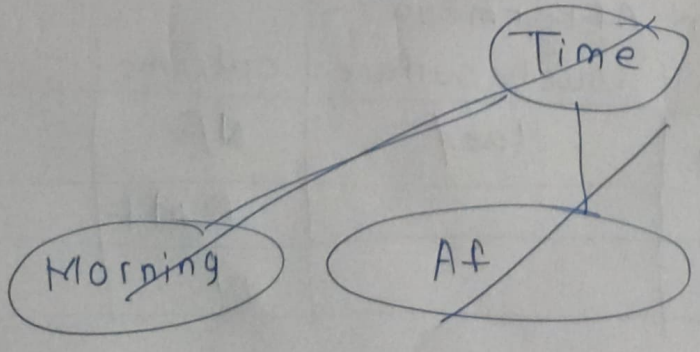
F = 7 N = 4

$$= -\left(\frac{7}{11}\right)\left(\log\frac{7}{11}\right) - \left(\frac{4}{11}\right)\left(\log\frac{4}{11}\right)$$

$$= -(0.63)(-0.66) - (0.3636)(-1.4740)$$

$$= 0.4158 + 0.5292$$

$$= 0.945$$



$$IG = 0.8960 - \left[\frac{2}{16} \times 0\right] + \left[\frac{3}{16} \times 0.9199\right] + \left[\frac{11}{16} \times 0.945\right]$$

$$= 0.8960 - [0.1724 + 0.6496]$$

$$= 0.8960 - 0.822$$

$IG(\text{Time}) = \underline{0.074}$

Spliting data on match_type: -

Time	Match-type	court-source	out-come
	Grand-slam		F
	Grand-slam		F
	Grand-slam		F
	Grand-slam		F
	Grand_slam		N
	Grand_slam		F
	Grand_slam		F

Total element = 7

F=6 N=1

$$E(\text{Grand slam}) = -\left(\frac{6}{7}\right)\left(\log_2\frac{6}{7}\right) - \left(\frac{1}{7}\right)\left(\log_2\frac{1}{7}\right)$$

$$= (+5)(0.06) - (0.14)($$

$$= (-0.857)(-0.02)(-0.35)(-2.000)$$

$$= 0.017 + 0.5 = \underline{0.217}$$

$E(\text{Master}) = \underline{1}$

Friendly = 3

F=2 N=1

$$= -\left(\frac{2}{3}\right)\left(\log_2\frac{2}{3}\right) - \left(\frac{1}{3}\right)\left(\log_2\frac{1}{3}\right)$$

$$= (-0.3956) + 0.5276)$$

$$= \underline{0.132}$$

$= 0.8960 - \left[\frac{16}{16}\right]$

$= 0.8960 - \left[(0.0094) + (0.375)(0.024)\right]$

$= 0.8960 - 0.493$

$IG(Match\text{-}type) = \underline{0.403}$

(1) spliting by cowet

clay = Total = 5

F = 2 N = 3

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

$= 0.5288 + 0.4422 = \underline{0.971}$

(2) Mixed = Total = 2

F = 0 N = 2

$= 0$

(3) Grass = Total = 4

F = 4 N = 0

$= 0$

(4) Hard = Total = 5

F = 5 N = 0

$= 0$

$IG = 0.8960 - \left[\left(\frac{5}{16} \times 0.971\right) + \left(\frac{2}{16} \times 0 + 0 + 0\right)\right]$

$= 0.8960 - 0.3034$

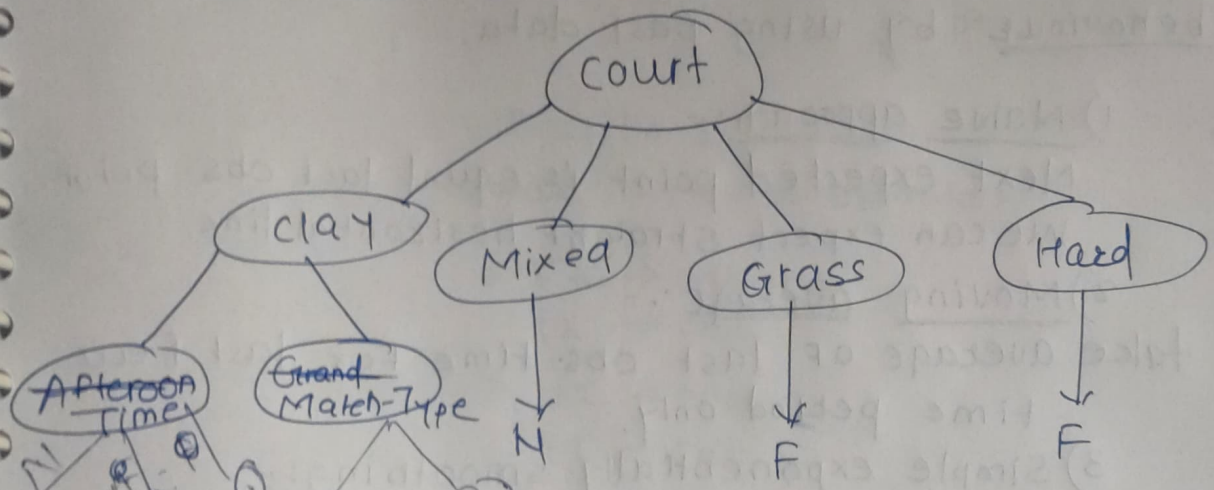
$IG(\text{Court}) = \underline{0.5926}$

$IG(\text{Time}) = 0.074$

$IG(\text{Match}) = 0.403$

$IG(\text{court}) = \underline{0.5926}$

∴ root node is Court surface.



Time	Match-type	court	out
After	Grand-slam	clay	F
noon	Master	clay	N
noon	Grand-slam	clay	N
~~Mate~~ noon	Master	clay	~~E~~ N
noon	Grand-slam	clay	F

$e(S) = \left(-\frac{2}{5}\right)\left(\log_2 \frac{2}{5}\right)\left(-\frac{3}{5}\right)\left(\log_2 \frac{3}{5}\right)$

$= +0.5288 + 0.4422$

$e(S) = \underline{0.971}$