

income	student	credit_rating	buys_computer
high	no	fair	no
high	no	excellent	no
high	no	fair	yes
medium	no	fair	yes
low	yes	fair	yes
low	yes	excellent	no
low	yes	excellent	yes
medium	no	fair	no
low	yes	fair	yes
medium	yes	fair	yes
medium	yes	excellent	yes
medium	no	excellent	yes
high	yes	fair	yes
medium	no	excellent	no
	high high high medium low low medium low medium medium medium	high no high no high no medium no low yes low yes medium no low yes medium yes medium yes medium yes medium yes medium no high yes	high no fair high no excellent high no fair medium no fair low yes fair low yes excellent low yes excellent medium no fair low yes fair medium yes fair medium yes fair medium yes excellent medium yes fair medium yes fair medium yes fair medium yes fair

- ☐ Class P: buys\_computer = "yes"
- ☐ Class N: buys\_computer = "no"

Yes: 9

No: 5

age	p <sub>i</sub>	n <sub>i</sub>	I(p <sub>i</sub> , n <sub>i</sub> )
<=30	2	3	0.971
3140	4	0	0
>40	3	2	0.971

$$Info(D) = -\sum_{i=1}^{m} p_i \log_2(p_i)$$

$$I_n f_0(D) = I(9,5) = -\frac{9}{14} l_{09} \cdot (\frac{9}{14}) - \frac{5}{14} l_{09} \cdot (\frac{5}{14}) = 0.940$$

$$Info_A(D) = \sum_{j=1}^{\nu} \frac{|D_j|}{|D|} \times Info(D_j)$$

$$\int_{age} \left( D \right) = \frac{5}{14} \left[ (2,3) + \frac{4}{14} \left[ (4,0) + \frac{5}{14} I (3,2) \right] \right]$$

$$= \frac{5}{14} \left( -\frac{2}{5} \log_2(\frac{1}{5}) - \frac{3}{5} \log_2(\frac{2}{5}) \right) + \frac{4}{14} \left( -\frac{4}{4} \log_2(\frac{4}{4}) \right) + \frac{5}{14} \left( -\frac{3}{5} \log_2(\frac{3}{5}) - \frac{1}{5} \log_2(\frac{1}{5}) \right)$$

$$= 0.694$$

Age	Buy_Computer		
	yes	no	
<=30	2	3	
3140	4	0	
>40	3	2	

$$Info_{income}(0) = \frac{4}{14}I(2,2) + \frac{6}{14}I(4,2) + \frac{4}{14}I(3,1)$$

$$= \frac{4}{14}(-\frac{2}{4}\log_2(\frac{1}{4}) - \frac{2}{4}\log_2(\frac{1}{4})) + \frac{6}{14}(-\frac{4}{6}\log_2(\frac{4}{6}) - \frac{2}{6}\log_2(\frac{2}{6})) + \frac{4}{14}(-\frac{5}{4}\log_2(\frac{5}{4}) - \frac{1}{4}\log_2(\frac{1}{4}))$$

$$= 0.911$$

income	Buy_Computer		
	yes	no	
high	2	2	
medium	4	2	
low	3	1	

Infostudent (D)	z	$\frac{7}{14}$ I (6,1) + $\frac{7}{14}$ I (3,4)
	=	$\frac{7}{14} \left(-\frac{6}{7} \log_2\left(\frac{6}{7}\right) - \frac{1}{7} \log_2\left(\frac{1}{7}\right)\right) + \frac{7}{14} \left(-\frac{3}{7} \log_2\left(\frac{3}{7}\right) - \frac{4}{7} \log_2\left(\frac{4}{7}\right)\right)$
	٤	0.769
T 0		

student	Buy_Computer			
	yes no			
yes	6	1		
no	3	4		

Info	edit (D	) = 4	I ( 6,2)	+ <u>6</u> I (3	3)			
		- <u>4</u>	(- <u>b</u> logs	$-\left(\frac{b}{4}\right) - \frac{L}{4}$	$\log_2\left(\frac{1}{4}\right)$	+ 6 (-3	log 2 (3/6) -	$\frac{3}{b} \log_2\left(\frac{3}{b}\right)$
		= 0	. 892					

Credit	Buy_Cor	nputer
rating	yes	no
fair	6	2
excellent	3	3

## $Gain(A) = Info(D) - Info_A(D)$

Gain (age) = Info(D) - Infoque (D) = 0.940 - 0.694 = 0.246 Gain (income) = Info (D) - Info (D) = 0.940 - 0.911 = 0.029 Grain (student) = Info (D) - Info student (D) = 0.940 - 0.789 = 0.151 Grain (credit\_rating) = Info(D) - Infocredit (D) = 0.940 - 0.892 : 0.044

age	income	student	credit	buys
			_rating	_ computer
∠ = 30	high	иo	fair	no
۷- 30	high	wo	excellent	no
<: 30	medium	WO	fair	no
∠ = 30	low	ye5	fair	yes
∠ : 30	medium	yes	excellent	yes

yes: 2 No: 3

Info(D) = 
$$I(2,3) = -\frac{2}{5}\log_2(\frac{2}{5}) - \frac{3}{5}\log_2(\frac{3}{5}) = 0.971$$

$$= \frac{2}{5} \left( -\frac{2}{2} \log_2 \left( \frac{1}{2} \right) \right) + \frac{2}{5} \left( -\frac{1}{2} \log_2 \left( \frac{1}{2} \right) - \frac{1}{2} \log_2 \left( \frac{1}{2} \right) \right) + \frac{1}{5} \left( -\frac{1}{1} \log_2 \left( \frac{1}{1} \right) \right)$$

= 0.4

$$Info_{student}(D) = \frac{2}{5}I(2,0) + \frac{3}{5}I(0,3)$$

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

$$= \frac{3}{5} \left( -\frac{1}{3} \log_2 \left( \frac{1}{3} \right) - \frac{2}{3} \log_2 \left( \frac{2}{3} \right) \right) + \frac{2}{5} \left( -\frac{1}{2} \log_2 \left( \frac{1}{2} \right) - \frac{1}{2} \log_2 \left( \frac{1}{2} \right) \right)$$

- 0.951

Gain(income)= Info()) - Informa()) = 0.940 - 0.4 = 0.571 Gain (student) = Info (D) - Infostudent (D) = 0.940 - 0 = 0.971 Gain (credit\_rating) = Info (D) - Info (redit (D) = 0.940 - 0.951 = 0.02 Income

High Y: 0/N:2 Medium Y:1/N:1 Low Y:1/N:0

Student

Yes 7:2/N:0 No Y:0/N:3

Credit Fair Y: 1/N: 2

age	income	student	credit	buys		
	1.1		_rating	_ computer		
31-40	high low	yes	Tair	yes Yes	V05:	Λ
31-40	medium	No	excellent	7e5	yes: No:	0
31-40	high	yes	fair	yes		
						1
	ome			dent		Fair
	: 0 / N:2			2/N:0 :0/N:3		Tair Excellen
Low Y	Y:1/N:1		1/0 1	.0/11.5		Excellen
	77100					
age	income	student	credit	buys		
			_rating	_ computer		
> 40	medium	МО	fair	ye5		
7 40	low	ye5	fair excellent	ye5	yes:	
> 40 > 40	medium	yes	fair	no yes	No:	2
> 40	medium	yes no	excellent	NO NO		
T 6						
$I_n f_0(D) = I(3,$	2) = -	3 log. (3) -	2 log2(2)=	0.971		
Info income (D) =	5 5 5	5 1 (1,1	)			
	3 (- 2 /092	(2)-1 log2	(1)) + 2(-1)e	$\log_2\left(\frac{1}{2}\right) - \frac{1}{2}\log$	2(1))	
	5 3	$(3\sqrt{3})^2$	3)/ 5(2	$9^2\left(\frac{1}{2}\right) = \frac{1}{2}$	(1)	
5	0.951					
T()	<b>.</b>					
Infostudent (D)	= 31(2,1	) + <u>2</u> <u>I</u> (	1,1)			
	= 3/-2 100	(2)-1)00	\ \ (1)\ + 2	$\frac{1}{2}\left(-\frac{1}{2}\log_2\left(\frac{1}{2}\right)^{-1}\right)$	1 (000(1)	
	5 3	$\frac{2}{3}$	$\left(\frac{3}{3}\right)$	2 10 12 (2)	$\frac{1}{2}$ $\int_{1}^{2} \left(\frac{1}{2}\right)$	
	= 0.951					
TC	0.7.					
Infocredit (D)	$=\frac{3}{5}\int (3,$	0) + <u>2</u> <u>1</u> 5	(0,1)			
	= 2/2/0	- (2) + 9	( 2 00 (2)	1		
	5 3	$9^{2}\left(\frac{3}{3}\right)^{\frac{2}{3}}$	$\left(-\frac{2}{2} \log_2\left(\frac{2}{2}\right)\right)$	))		
	0					
G Tr	1 7 (1)	(D)	0.45			
Gaincincomes=Info						
Gain(student) = I, Gain(credit_rating) :					,,	
OTATIO (Credit_ rating)	- THIO CDJ	INTO credit (V)	- U.M II	U - U,M		

redit Y: 1/N: 2 int Y: 1/N: 1 Income
High Y:0/N:0
Medium Y:2/N:1
Low Y:1/N:1 Student Yes 7:2/N:1 No 7:1/N:1 Credit
Fair Y: 3/N:0
Excellent Y: 0/N:2

	age	income	student	credit_rating	buys_computer	
	<=30	high	no	fair	no	
	<=30	high	no	excellent	no	
	3140	high	no	fair	yes	
	>40	medium	no	fair	yes	
	>40	low	yes	fair	yes	
	>40	low	yes	excellent	no	
	3140	low	yes	excellent	yes	
	<=30	medium	no	fair	no	
	<=30	low	yes	fair	yes	
	>40	medium	yes	fair	yes	
	<=30	medium	yes	excellent	yes	
	3140		no	excellent	yes	
	3140		yes	fair	yes	
	>40	medium	no	excellent	no	
						1.
age	b	mys_	age .	··· buys_	age	buys_
	Co	mputer		Computer		Computer
< = 30		no	31 - 40	yes	740	2106
						yes
∠= 30		no	31 - 40	yes yes	7 40	yes
<u>ا</u> 30		no	31 - 40	yes	7 40	y0
< = 30	,	yes	31 - 40	y e5	>40	yes
∠: 30		405			>40	no no
			0			1
Tira	ain student =	0.971	B	NY	Grain credit_ro	ating = 0.971
						,
Stu	dent !	ouys			Credit	buys_
		omputer				Computer
lo.	0					
		no			no	no
n	0	чо			n o	หตุ
Ŋ	10	no			no	no no
У	ies .	yes			yes	yes
y	res	yes			yes	yes
N		7				fair
No		Tes			excellent	Tair
Not buy		Buy			Not Luy	Buy

Not buy