age	p_i	n_i	$I(p_i, n_i)$
<=30	2	3	0.971
31...40	4	0	0
>40	3	2	0.971

age	income	student	credit_rating	buys_computer
<=30	high	no	fair	no
<=30	high	no	excellent	no
31...40	high	no	fair	yes
>40	medium	no	fair	yes
>40	low	yes	fair	yes
>40	low	yes	excellent	no
31...40	low	yes	excellent	yes
<=30	medium	no	fair	no
<=30	low	yes	fair	yes
>40	medium	yes	fair	yes
<=30	medium	yes	excellent	yes
31...40	medium	no	excellent	yes
31...40	high	yes	fair	yes
>40	medium	no	excellent	no

Class P: buys_computer = "yes"
Class N: buys_computer = "no"

$yes = 9$, $No = 5$

Age
$\leq = 30$	Y:2, N:3
31-40	Y:4, N:0
>40	Y:3, N:2

Income
High	Y:2, N:2
Meduim	Y:4, N:2
Low	Y:3, N:1

Student
Yes	Y:6, N:1
No	Y:3, N:4

Credit
Yes	Y:6, N:2
No	Y:3, N:3

$$Info(D) = I(9,5) = -\left(\frac{9}{14}\right)\log_2\left(\frac{9}{14}\right) - \frac{5}{14}\log_2\left(\frac{5}{4}\right) = 0.940$$

$$Info_{age}(D) = \frac{5}{14}I(2,3) + \frac{4}{14}I(4,0) + \frac{5}{14}I(3,2)$$

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

$$= 0.694$$

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

$$= 0.911$$

$$Info_{student}(D) = \frac{7}{14}I(6,1) + \frac{7}{14}I(3,4)$$

$$= 0.789$$

$$Info_{credit}(D) = \frac{8}{14}I(6,2) + \frac{6}{14}I(3,3)$$

$$= 0.892$$

Gain (age) = Info(D) - Info$_{age}$(D) = 0.940 - 0.694 = 0.246

Gain (income) = Info(D) - Info$_{income}$(D) = 0.940 - 0.911 = 0.029

Gain (student) = Info(D) - Info$_{student}$(D) = 0.940 - 0.789 = 0.151

Gain (Credit_rating) = Info(D) - Info$_{credit}$(D) = 0.940 - 0.892 = 0.048

age	income	student	Credit	buy
< = 30	high	no	fair	no
< = 30	high	no	exellent	no
< = 30	meduim	no	fair	no
< = 30	low	Yes	fair	yes
< = 30	meduim	Yes	excellent	Yes

$Yes = 2$, $No = 3$

Income

High $\quad Y:0, N:2$

Meduim $\quad Y:1, N:1$

Low $\quad Y:1, N:0$

Student

Yes $\quad Y:2, N:0$

No $\quad Y:0, N:3$

Credit

Yes $\quad Y:1, N:2$

No $\quad Y:1, N:1$

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

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

$$= \frac{2}{5}\left(-\frac{2}{2}\log_2\frac{2}{2}\right) + \frac{2}{5}\left(-\frac{1}{2}\log_2\frac{1}{2} - \frac{1}{2}\log_2\frac{1}{2}\right) + \frac{1}{5}\left(-\frac{1}{1}\log_2\frac{1}{1}\right) = 0.4$$

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

$$= \frac{2}{5}\left(-\frac{2}{2}\log_2\frac{2}{2}\right) + \frac{3}{5}\left(-\frac{3}{3}\log_2\frac{3}{3}\right) = 0$$

$$Info_{credit}(D) = \frac{3}{5}I(1,2) + \frac{2}{5}I(1,1)$$

$$= \frac{3}{5}\left(-\frac{1}{3}\log_2\frac{1}{3} - \frac{2}{3}\log_2\frac{2}{3}\right) + \frac{2}{5}\left(-\frac{1}{2}\log_2\frac{1}{2} - \frac{1}{2}\log_1\frac{1}{2}\right) = 0.951$$

$$Gain(income) = Info(D) - Info_{income}(D) = 0.971 - 0.4 = 0.571$$

$$Gain(student) = Info(D) - Info_{student}(D) = 0.971 - 0 = 0.971$$

$$Gain(Credit\_rating) = Info(D) - Info_{credit}(D) = 0.971 - 0.951 = 0.951$$

F2

age	income	student	Credit	buy
31-40	high	no	fair	yes
31-40	Low	yes	excellent	yes
31-40	Meduim	no	excellent	yes
31-40	high	yes	fair	yes

Yes = 4, No = 0

Income
High	Y: 2,	N: 0
Meduim	Y: 1,	N: 0
Low	Y: 1,	N: 0

Student
Yes	Y: 2,	N: 0
No	Y: 2,	N: 0

Credit
Yes	Y: 2,	N: 0
No	Y: 2,	N: 0

F 3

age	income	student	Credit	buy
> 40	meduim	no	fair	Yes
> 40	low	yes	fair	yes
> 40	low	Yes	exellent	no
> 40	meduim	Yes	fair	Yes
> 40	medain	no	excellent	no

Yes = 3 , No = 2

Income
High   Y:0, N:0
Medaim Y:2, N:1
Low   Y:1, N:1

Student
Yes   Y:2, N:1
No   Y:1, N:1

Credit
Yes   Y:3, N:0
No   Y:0, N:2

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

$$\text{Info}_{income}(D) = \frac{3}{5} I(2,1) + \frac{2}{5} I(1,1)$$

$$= \frac{3}{5}\left(-\frac{2}{3}\log_2\frac{2}{3} - \frac{1}{3}\log_2\frac{1}{3}\right) + \frac{2}{5}\left(-\frac{1}{2}\log_2\frac{1}{2} \log_2\frac{1}{2}\right) = 0.951$$

$$\text{Info}_{student}(D) = \frac{3}{5} I(2,1) + \frac{2}{5} I(1,1)$$

$$= \frac{3}{5}\left(-\frac{2}{3}\log_2\frac{2}{3} - \frac{1}{3}\log_2\frac{1}{3}\right) + \frac{2}{5}\left(-\frac{1}{2}\log_2 - \frac{1}{2}\log_2\frac{1}{2}\right) = 0.951$$

$$\text{Info}_{credit}(D) = \frac{3}{5} I(3,0) + \frac{2}{5} I(0,2)$$

$$= \frac{3}{5}\left(-\frac{3}{3}\log_2\frac{3}{3}\right) + \frac{2}{5}\left(-\frac{2}{2}\log_2\frac{2}{2}\right) = 0$$

$$\text{Gain (income)} = \text{Info}(D) - \text{Info}_{income}(D) = 0.971 - 0.951 = 0.02$$
$$\text{Gain (student)} = \text{Info}(D) - \text{Info}_{student}(D) = 0.971 - 0.951 = 0.02$$
$$\text{Gain (Credit\_rating)} = \text{Info}(D) - \text{Info}_{credit}(D) = 0.971 - 0 = 0.971$$

age	income	student	credit_rating	buys_computer
<=30	high	no	fair	no
<=30	high	no	excellent	no
31…40	high	no	fair	yes
>40	medium	no	fair	yes
>40	low	yes	fair	yes
>40	low	yes	excellent	no
31…40	low	yes	excellent	yes
<=30	medium	no	fair	no
<=30	low	yes	fair	yes
>40	medium	yes	fair	yes
<=30	medium	yes	excellent	yes
31…40	medium	no	excellent	yes
31…40	high	yes	fair	yes
>40	medium	no	excellent	no

age	...	buy
<=30		no
<=30		no
<=30		no
<=30		Yes
<=30		Yes

age	...	buy
31-40		Yes
31-40		yes
31-40		Yes
31-40		Yes

age	...	buy
>40		Yes
>40		yes
>40		no
>40		yes
>40		no

Buy

Gain student = 0.971

Student	buy
no	no
no	no
no	no
yes	Yes
Yes	Yes

Gain credit_rating = 0.971

Credit	buy
fair	no
fair	no
exellent	no
fair	yes
exellent	yes

No → Not buy

Yes → Buy

excellent → Not buy

fair → Buy