

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

$$y = 8, n = 14$$

$$Info(D) = I(8, 6) = -\frac{8}{14} \log_2 \left(\frac{8}{14} \right) - \frac{6}{14} \log_2 \left(\frac{6}{14} \right) = \log_2 14 - \frac{2}{3} \approx 0.9183$$

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

age	p_i	n_i	$I(p_i, n_i)$
<=30	2	2	1
31...40	3	0	
>40	3	2	

$$Info_{<=30}(D) = I(2, 2) = -\frac{2}{4} \log_2 \left(\frac{2}{4} \right) - \frac{2}{4} \log_2 \left(\frac{2}{4} \right) = 1$$

$$Info_{31...40}(D) = I(3, 0) = -\frac{3}{3} \log_2 \left(\frac{3}{3} \right) - \frac{0}{3} \log_2 \left(\frac{0}{3} \right) = 0$$

$$Info_{>40}(D) = I(3, 2) = -\frac{3}{5} \log_2 \left(\frac{3}{5} \right) - \frac{2}{5} \log_2 \left(\frac{2}{5} \right) = 0.9710$$

$$Info_{age}(D) = \frac{5}{14} I(2, 3) + \frac{4}{14} I(3, 0) + \frac{5}{14} I(3, 2) = 0.694$$

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$\frac{5}{14} I(2, 3)$ means "age <=30" has 5 out of 14 samples, with 2 yes'es and 3 no's.

Hence

$$Gain(age) = Info(D) - Info_{age}(D) = 0.246$$

Similarly, we can get

$$Gain(income) = 0.029$$

$$Gain(student) = 0.151$$

$$Gain(credit_rating) = 0.048$$