

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

$$Info(D) = I(9,5) = -\frac{9}{14} \log_2 \left(\frac{9}{14} \right) - \frac{5}{14} \log_2 \left(\frac{5}{14} \right) = 0.409 - (-0.531) = 0.940$$

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

$$= \frac{5}{14} \left(-\frac{2}{3} \log_2 \left(\frac{2}{5} \right) - \frac{3}{5} \log_2 \left(\frac{3}{5} \right) \right) + \frac{4}{14} \left(-\frac{4}{4} \log_2 \left(\frac{4}{4} \right) - \frac{0}{4} \log_2 \left(\frac{0}{4} \right) \right) + \frac{5}{14} \left(-\frac{3}{5} \log_2 \left(\frac{3}{5} \right) - \frac{2}{5} \log_2 \left(\frac{2}{5} \right) \right)$$

$$= 0.347 + 0 + 0.347$$

$$= 0.694$$

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

$$= \frac{4}{14} \left(-\frac{3}{4} \log_2 \left(\frac{3}{4} \right) - \frac{1}{4} \log_2 \left(\frac{1}{4} \right) \right) + \frac{6}{14} \left(-\frac{4}{6} \log_2 \left(\frac{4}{6} \right) - \frac{2}{6} \log_2 \left(\frac{2}{6} \right) \right) + \frac{4}{14} \left(-\frac{2}{4} \log_2 \left(\frac{2}{4} \right) - \frac{2}{4} \log_2 \left(\frac{2}{4} \right) \right)$$

$$= 0.232 + 0.393 + 0.286$$

$$= 0.911$$

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

$$= \frac{7}{14} \left(-\frac{6}{7} \log_2 \left(\frac{6}{7} \right) - \frac{1}{7} \log_2 \left(\frac{1}{7} \right) \right) + \frac{7}{14} \left(-\frac{3}{7} \log_2 \left(\frac{3}{7} \right) - \frac{4}{7} \log_2 \left(\frac{4}{7} \right) \right)$$

$$= 0.296 + 0.493$$

$$= 0.789$$

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

$$= \frac{6}{14} \left(-\frac{3}{6} \log_2 \left(\frac{3}{6} \right) - \frac{3}{6} \log_2 \left(\frac{3}{6} \right) \right) + \frac{8}{14} \left(-\frac{6}{8} \log_2 \left(\frac{6}{8} \right) - \frac{2}{8} \log_2 \left(\frac{2}{8} \right) \right)$$

$$= 0.429 + 0.463$$

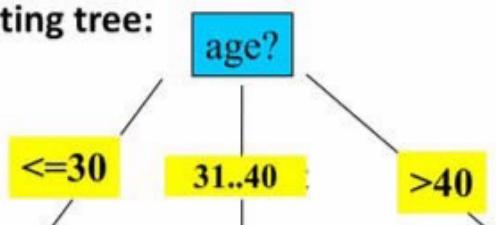
$$= 0.892$$

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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)	$= Info(D) - Info_{credit_rating}(D)$	$= 0.940 - 0.892 = 0.048$

ting tree:



Age > student > credit_rating > income