HW 2

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

features (age, income, student, credit_rating) — class (buys_computer)

จาก $Info(D) = I(9,5)$

$$= -\frac{9}{14}\log_2\left(\frac{9}{14}\right) - \frac{5}{14}\log_2\left(\frac{9}{14}\right) = 0.940$$

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

$$= 0.694$$

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

$$= 0.911$$

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

$$= 0.789$$

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

$$= 0.892$$

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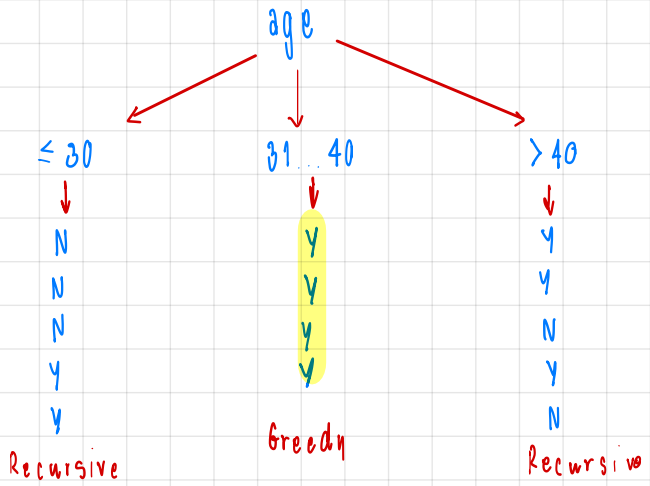
Gain (age) : $\text{Info}(D) - \text{Info}_{age}(D)$

$= 0.940 - 0.694 = 0.246$

Gain (income) : $0.940 - 0.911 = 0.029$

Gain (student) : $0.940 - 0.789 = 0.151$

Gain (credit_rating) $= 0.940 - 0.892 = 0.048$



Info (D) : $I(2,3)$

$= -\frac{2}{5}\log_2\left(\frac{2}{5}\right) - \frac{3}{5}\log_2\left(\frac{3}{5}\right) = 0.9710$

$\text{Info}_{income}(D) : \frac{2}{5} I(0,2) + \frac{2}{5} I(1,1) + \frac{1}{5} I(1,0)$

$= 0.4$

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

$= 0$

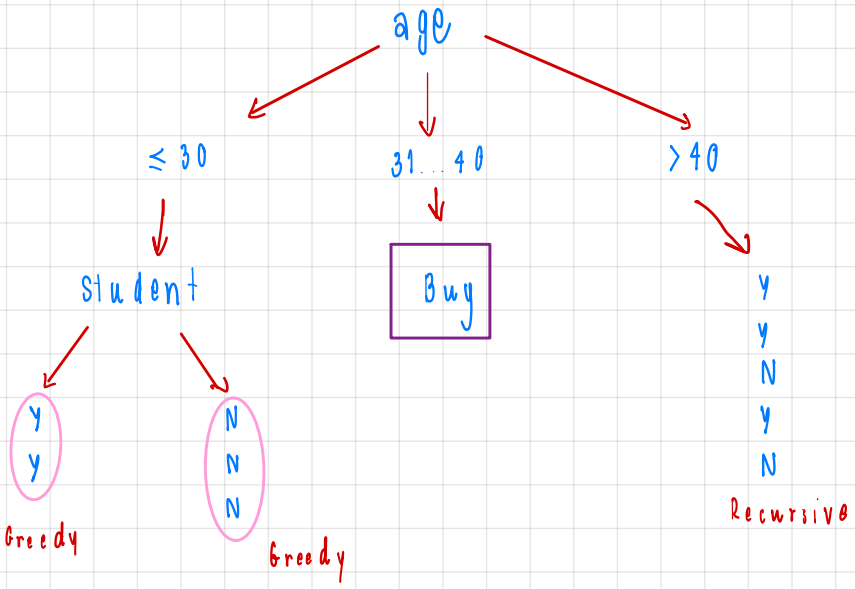
$\text{Info}_{credit}(D) : \frac{2}{5} I(1,1) + \frac{3}{5} I(1,2)$

$= 0.9509$

Gain (income) $= 0.9710 - 0.4 = 0.5710$

Gain (student) $= 0.9710 - 0 = 0.9710$

Gain (credit_rating) $= 0.9710 - 0.9509 = 0.0201$



$$Info(D) = I(3,2)$$

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

$$= 0.971$$

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

$$= 0.9509$$

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

$$= 0.9509$$

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

$$= 0$$

$$Gain(income) = 0.9710 - 0.9509 = 0.0201$$

$$Gain(student) = 0.0201$$

$$Gain(credit\_rating) = 0.9710 - 0 = 0.9710$$

Decision Tree