Naïve Bayes Classifier: Training Dataset

input → Data to be classified

$$X = (Age = 31...40, income = high, student = yes, credit\_rating = fair)$$

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:

C_1: buys_computer = 'yes'

C_2: buys_computer = 'no'

$P(C_i)$: $P(buys\_computer = "yes") = 9/14 = 0.643$

$P(buys\_computer = "no") = 5/14 = 0.357$

Compute $P(X|C_i)$ for each class

$P(age = "31...40" \mid buys\_computer = "yes") = (4+1)/9 = 5/9 = 0.555$

$P(age = "31...40" \mid buys\_computer = "no") = 0/5 = 0 \rightarrow 1/5 = 0.2$

$P(income = "high" \mid buys\_computer = "yes") = 2/9 = 0.222$

$P(income = "high" \mid buys\_computer = "no") = 2/5 = 0.4$

$P(\text{student} = \text{"yes"} \mid \text{buys\_comper} = \text{"yes"}) = 6/9 = 0.667$

$P(\text{student} = \text{"yes"} \mid \text{buys\_comper} = \text{"no"}) = 1/5 = 0.2$

$P(\text{credit\_rating} = \text{"fair"} \mid \text{buys\_computer} = \text{"yes"}) = 6/9 = 0.667$

$P(\text{credit\_rating} = \text{"fair"} \mid \text{buys\_computer} = \text{"no"}) = 2/5 = 0.4$

$X = (\text{Age} = 31\ldots40, \text{income} = \text{high}, \text{student} = \text{yes}, \text{credit\_rating} = \text{fair})$

$P(X \mid C_i) : P(X \mid \text{buys\_computer} = \text{"yes"}) = 0.555 \times 0.222 \times 0.667 \times 0.667 = 0.055$

$P(X \mid \text{buys\_computer} = \text{"no"}) = 0.2 \times 0.4 \times 0.2 \times 0.4 = 0.006$

$P(X \mid C_i) * P(C_i) : P(X \mid \text{buys\_computer} = \text{"yes"}) * P(\text{buys\_computer} = \text{"yes"})$

$= 0.055 \times 0.643 = 0.035 \checkmark$

$P(X \mid \text{buys\_computer} = \text{"yes"}) * P(\text{buys\_computer} = \text{"yes"})$

$= 0.006 \times 0.357 = 0.002$

There fore, X belongs to class ("buys_computer = "yes")

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