

Q1

$Y = \{YES, NO\}$

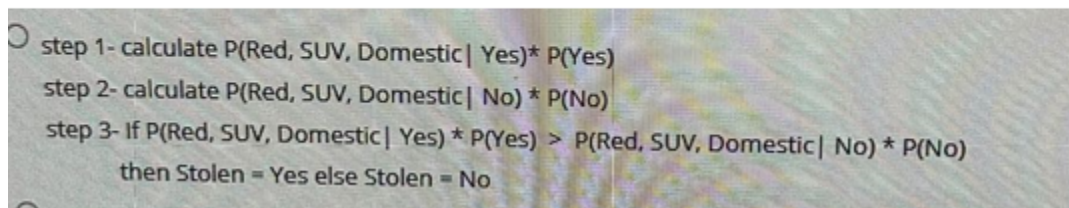
Because Y is dependent variable we try to explain and predict the value of the dependent variable with the help of the independent variables

Q2

$X = \{x1=color, x2=type, x3=origin\}$

Because x is independent variable and we may have one or more independent variables

Q3



step 1- calculate $P(\text{Red, SUV, Domestic} | \text{Yes}) * P(\text{Yes})$
step 2- calculate $P(\text{Red, SUV, Domestic} | \text{No}) * P(\text{No})$
step 3- If $P(\text{Red, SUV, Domestic} | \text{Yes}) * P(\text{Yes}) > P(\text{Red, SUV, Domestic} | \text{No}) * P(\text{No})$
then Stolen = Yes else Stolen = No

Because Naïve Bayes says that if We will calculate this value for all possible values of the class y value and pick up the output with maximum probability This can be expressed as:

$$y = \underset{y}{\operatorname{argmax}} \ p(y) \prod_{i=1}^n P(x_i|y)$$

Q4

0.024 and 0.072

$$P(\text{stolen=yes})=5/10=0.5$$

$$P(\text{stolen=no})=5/10=0.5$$

$$P(\text{Color} = \text{Red} \mid \text{Stolen} = \text{yes}) = \frac{3}{5} = 0.6$$

$$P(\text{Color} = \text{Red} \mid \text{Stolen} = \text{no}) = \frac{2}{5} = 0.4$$

$$P(\text{Color} = \text{Yellow} \mid \text{Stolen} = \text{yes}) = \frac{2}{5} = 0.4$$

$$P(\text{Color} = \text{Yellow} \mid \text{Stolen} = \text{no}) = \frac{3}{5} = 0.6$$

$$P(\text{Type} = \text{Sport} \mid \text{Stolen} = \text{yes}) = 4/5 = 0.8$$

$$P(\text{Type} = \text{Sport} \mid \text{Stolen} = \text{no}) = 2/5 = 0.4$$

$$P(\text{Type} = \text{SUV} \mid \text{Stolen} = \text{yes}) = 1/5 = 0.2$$

$$P(\text{Type} = \text{SUV} \mid \text{Stolen} = \text{no}) = 3/5 = 0.6$$

$$P(\text{Origin} = \text{Domestic} \mid \text{Stolen} = \text{yes}) = 2/5 = 0.4$$

$$P(\text{Origin} = \text{Domestic} \mid \text{Stolen} = \text{No}) = 3/5 = 0.6$$

$$P(\text{Origin} = \text{Imported} \mid \text{Stolen} = \text{yes}) = 3/5 = 0.6$$

$$P(\text{Origin} = \text{Imported} \mid \text{Stolen} = \text{no}) = 2/5 = 0.4$$

* For Stolen = yes :

$$\Rightarrow (\text{color} = \text{Red} \mid \text{stolen} = \text{yes}) * (\text{Type} = \text{SUV} \mid \text{stolen} = \text{yes}) * (\text{Origin} = \text{Domestic} \mid \text{Stolen} = \text{yes}) * P(\text{yes})$$

$$\Rightarrow 0.6 * 0.2 * 0.4 * 0.5$$

$$\Rightarrow \underline{0.024}$$

* For Stolen = No :

$$(\text{color} = \text{Red} \mid \text{stolen} = \text{No}) * (\text{Type} = \text{SUV} \mid \text{stolen} = \text{No}) * (\text{Origin} = \text{Domestic} \mid \text{stolen} = \text{No}) * P(\text{No})$$

$$\Rightarrow 0.4 * 0.6 * 0.6 * 0.5$$

$$\Rightarrow \underline{0.072}$$

Q5

NO it is not

Since $0.024 < 0.072$ then the vehicle is classified as not stolen,