COMP111 - Exercise 9 Answers

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1. To answer the question, we must find the results to whether he likes and doesn't like the specified attributes using the following probabilities:

$$P(\textit{likes}=\text{Yes}|\textit{colour}=\text{Red}, \textit{type}=\text{SUV}, \textit{origin}=\text{Domestic})$$
$$P(\textit{likes}=\text{No}|\textit{colour}=\text{Red}, \textit{type}=\text{SUV}, \textit{origin}=\text{Domestic})$$

I will now transform these into simple probabilities focusing on the *likes* = Yes case:

$$\begin{aligned} V_{\text{Yes}} &= P(\text{Red, SUV, Domestic}|\text{Yes})P(\text{Yes}) \\ &= P(\text{Red}|\text{Yes})P(\text{SUV}|\text{Yes})P(\text{Domestic}|\text{Yes})P(\text{Yes}) \end{aligned}$$

The opposite is also true:

$$V_{\text{No}} = P(\text{Red}|\text{No})P(\text{SUV}|\text{No})P(\text{Domestic}|\text{No})P(\text{No})$$

From the table we can calculate:

- $P(\text{Red}|\text{Yes}) = \frac{3}{5}$
- $P(\text{SUV}|\text{Yes}) = \frac{1}{5}$
- $P(\text{Domestic}|\text{Yes}) = \frac{2}{5}$
- $P(\text{Red}|\text{No}) = \frac{2}{5}$
- $P(\text{SUV}|\text{No}) = \frac{3}{5}$
- $P(\text{Domestic}|\text{No}) = \frac{3}{5}$
- $P(\text{Yes}) = \frac{5}{10}$
- $P(\text{No}) = \frac{5}{10}$

Then, from the equations V_{Yes} and V_{No} above, we get the following:

$$\begin{aligned} V_{\text{Yes}} &= \frac{3}{5} \times \frac{1}{5} \times \frac{2}{5} \times \frac{5}{10} \\ &= 0.024 \\ V_{\text{No}} &= \frac{2}{5} \times \frac{3}{5} \times \frac{3}{5} \times \frac{5}{10} \\ &= 0.072 \end{aligned}$$

As $V_{\text{Yes}} < V_{\text{No}}$, by the naive Bayes' classifier, the friend will *n*ot like the car.