CSC4008 homework6: Naive Bayes classifier

T1.

(i) $P(\text{Home Owner} = \text{Yes} \mid \text{No}) = \frac{3+1}{7+2} = \frac{4}{9}$

$P(\text{Home Owner} = \text{No} \mid \text{No}) = \frac{4+1}{7+2} = \frac{5}{9}$

$P(\text{Home Owner} = \text{Yes} \mid \text{Yes}) = \frac{0+1}{3+2} = \frac{1}{5}$

$P(\text{Home Owner} = \text{No} \mid \text{Yes}) = \frac{3+1}{3+2} = \frac{4}{5}$

$P(\text{Marital Status} = \text{Single} \mid \text{No}) = \frac{2+1}{7+3} = \frac{3}{10}$

$P(\text{Marital Status} = \text{Divorced} \mid \text{No}) = \frac{1+1}{7+3} = \frac{1}{5}$

$P(\text{Marital Status} = \text{Married} \mid \text{No}) = \frac{4+1}{7+3} = \frac{1}{2}$

$P(\text{Marital Status} = \text{Single} \mid \text{Yes}) = \frac{2+1}{3+3} = \frac{1}{2}$

$P(\text{Marital Status} = \text{Divorced} \mid \text{Yes}) = \frac{1+1}{3+3} = \frac{1}{3}$

$P(\text{Marital Status} = \text{Married} \mid \text{Yes}) = \frac{0+1}{3+3} = \frac{1}{6}$

$P(\text{Annual Income} = \text{low} \mid \text{No}) = \frac{3+1}{7+3} = \frac{2}{5}$

$P(\text{Annual Income} = \text{middle} \mid \text{No}) = \frac{1+1}{7+3} = \frac{1}{5}$

$P(\text{Annual Income} = \text{high} \mid \text{No}) = \frac{3+1}{7+3} = \frac{2}{5}$

$P(\text{Annual Income} = \text{low} \mid \text{Yes}) = \frac{0+1}{3+3} = \frac{1}{6}$

$P(\text{Annual Income} = \text{middle} \mid \text{Yes}) = \frac{3+1}{3+3} = \frac{2}{3}$

$P(\text{Annual Income} = \text{high} \mid \text{Yes}) = \frac{0+1}{3+3} = \frac{1}{6}$

(ii) $P(Yes) = \frac{3+1}{10+2} = \frac{1}{3}$

$P(No) = \frac{7+1}{10+2} = \frac{2}{3}$

$P(X|Yes)P(Yes) = \frac{4}{5} \times \frac{1}{6} \times \frac{1}{6} \times \frac{1}{3} = \frac{1}{135}$

$P(X|No)P(No) = \frac{5}{9} \times \frac{1}{2} \times \frac{2}{5} \times \frac{2}{3} = \frac{2}{27}$

$\therefore P(X|No)P(No) > P(X|Yes)P(Yes)$

$\therefore$ the predict class label is : No