

ML-2

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1 Task-1

$$P(\text{Maine}) = 0.05$$

$$P(\text{Sahara}) = 0.95$$

$$P(T > 80 | \text{Maine}) = 0.20$$

$$P(T > 80 | \text{Sahara}) = 0.90$$

1.1 Part-a

$$P(\text{Maine} | T < 80) = \frac{P(T < 80 | \text{Maine}) * P(\text{Maine})}{P(T < 80)}$$

$$P(T < 80 | \text{Maine}) = 0.80$$

$$P(T < 80) = P(\text{Maine}) * P(T < 80 | \text{Maine}) + P(\text{Sahara}) * P(T < 80 | \text{Sahara})$$

$$P(T < 80) = 0.05 * 0.80 + 0.95 * 0.1$$

$$P(T < 80) = 0.04 + 0.095$$

$$P(T < 80) = 0.135$$

$$P(\text{Maine} | T < 80) = \frac{0.80 * 0.05}{0.135}$$

$$P(\text{Maine} | T < 80) = \frac{0.04}{0.135}$$

$$P(\text{Maine} | T < 80) = 0.296$$

1.2 Part-b

$$P(T_2 < 80 | T_1 < 80)$$

$$= P(T_2 < 80 | \text{Maine}) * P(\text{Maine} | T_1 < 80) + P(T_2 < 80 | \text{Sahara}) * P(\text{Sahara} | T_1 < 80)$$

$$= (0.8 * 0.296) + (0.1 * \frac{P(T < 80 | \text{Sahara}) * P(\text{Sahara})}{P(T < 80)})$$

$$= 0.23 + 0.07$$

$$= 0.30$$

1.3 Part-c

$$P(T_3 < 80, T_2 < 80, T_1 < 80)$$

$$= (0.135 * 0.135 * 0.135)$$

$$= 0.0025$$

2 Task-2

If the sum of P(C) and P(D) is 0.1 where P(C) and P(D) is greater than 0(zero) then we can say the P is a valid probability function

3 Task-3

The sum of the P when $X = 0$ to $X = 10$, $P(X) = 0.3$ is 3, and the Probability density function is lower than 1 between the intervals. Therefore, This P function is definitely not a probability density function.

4 Task-4

If we choose apple then

$$P(F = a) = (0.25 * 0.4) + (0.75 * 0.6)$$

$$P(F = a) = 0.1 + 0.45 = 0.55$$

$$P(F = o) = 1 - 0.55 = 0.45$$

$$P(B = r|F = a) = \frac{0.25*0.4}{0.55} = \frac{0.1}{0.55} = 0.1818$$

$$P(B = b|F = a) = \frac{0.75*0.6}{0.55} = \frac{0.45}{0.55} = 0.8181$$

$$P(B = r|F = o) = \frac{0.75*0.4}{0.45} = \frac{0.3}{0.45} = 0.6667$$

$$P(B = b|F = o) = \frac{0.25*0.6}{0.45} = \frac{0.15}{0.45} = 0.3333$$

The accuracy of the classifier when we choose $B = b$ give $F=a$ is 81.81%
The accuracy of the classifier when we choose $B = r$ give $F=a$ is 18.18%
The accuracy of the classifier when we choose $B = r$ give $F=o$ is 66.67%
The accuracy of the classifier when we choose $B = b$ give $F=o$ is 33.33%

5 Task-5

Training : -

```
Class 1, attribute 1, mean = 0.52, std=0.10
Class 1, attribute 2, mean = 0.54, std=0.10
Class 1, attribute 3, mean = 0.52, std=0.07
Class 1, attribute 4, mean = 0.41, std=0.17
Class 1, attribute 5, mean = 0.50, std=0.01
Class 1, attribute 6, mean = 0.00, std=0.01
Class 1, attribute 7, mean = 0.50, std=0.05
Class 1, attribute 8, mean = 0.24, std=0.05
Class 2, attribute 1, mean = 0.45, std=0.11
Class 2, attribute 2, mean = 0.45, std=0.10
Class 2, attribute 3, mean = 0.53, std=0.06
Class 2, attribute 4, mean = 0.23, std=0.11
Class 2, attribute 5, mean = 0.50, std=0.04
Class 2, attribute 6, mean = 0.00, std=0.01
Class 2, attribute 7, mean = 0.49, std=0.06
Class 2, attribute 8, mean = 0.33, std=0.14
Class 3, attribute 1, mean = 0.43, std=0.10
Class 3, attribute 2, mean = 0.48, std=0.11
Class 3, attribute 3, mean = 0.36, std=0.06
Class 3, attribute 4, mean = 0.22, std=0.08
Class 3, attribute 5, mean = 0.51, std=0.05
Class 3, attribute 6, mean = 0.00, std=0.01
Class 3, attribute 7, mean = 0.51, std=0.04
Class 3, attribute 8, mean = 0.27, std=0.09
Class 4, attribute 1, mean = 0.79, std=0.07
Class 4, attribute 2, mean = 0.76, std=0.07
Class 4, attribute 3, mean = 0.38, std=0.06
Class 4, attribute 4, mean = 0.32, std=0.11
Class 4, attribute 5, mean = 0.50, std=0.01
Class 4, attribute 6, mean = 0.00, std=0.01
Class 4, attribute 7, mean = 0.51, std=0.07
Class 4, attribute 8, mean = 0.27, std=0.09
Class 5, attribute 1, mean = 0.74, std=0.15
Class 5, attribute 2, mean = 0.62, std=0.12
Class 5, attribute 3, mean = 0.42, std=0.08
Class 5, attribute 4, mean = 0.30, std=0.12
Class 5, attribute 5, mean = 0.50, std=0.01
Class 5, attribute 6, mean = 0.00, std=0.01
Class 5, attribute 7, mean = 0.51, std=0.06
Class 5, attribute 8, mean = 0.24, std=0.04
Class 6, attribute 1, mean = 0.54, std=0.14
Class 6, attribute 2, mean = 0.50, std=0.12
Class 6, attribute 3, mean = 0.51, std=0.05
Class 6, attribute 4, mean = 0.24, std=0.10
Class 6, attribute 5, mean = 0.50, std=0.01
Class 6, attribute 6, mean = 0.49, std=0.38
Class 6, attribute 7, mean = 0.51, std=0.03
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Class 5, attribute 7, mean = 0.51, std=0.06
Class 5, attribute 8, mean = 0.24, std=0.04
Class 6, attribute 1, mean = 0.54, std=0.14
Class 6, attribute 2, mean = 0.50, std=0.12
Class 6, attribute 3, mean = 0.51, std=0.05
Class 6, attribute 4, mean = 0.24, std=0.10
Class 6, attribute 5, mean = 0.50, std=0.01
Class 6, attribute 6, mean = 0.49, std=0.38
Class 6, attribute 7, mean = 0.51, std=0.03
Class 6, attribute 8, mean = 0.24, std=0.05
Class 7, attribute 1, mean = 0.48, std=0.11
Class 7, attribute 2, mean = 0.47, std=0.09
Class 7, attribute 3, mean = 0.54, std=0.06
Class 7, attribute 4, mean = 0.22, std=0.12
Class 7, attribute 5, mean = 0.50, std=0.04
Class 7, attribute 6, mean = 0.00, std=0.03
Class 7, attribute 7, mean = 0.50, std=0.06
Class 7, attribute 8, mean = 0.26, std=0.09
Class 8, attribute 1, mean = 0.74, std=0.10
Class 8, attribute 2, mean = 0.73, std=0.11
Class 8, attribute 3, mean = 0.49, std=0.05
Class 8, attribute 4, mean = 0.29, std=0.07
Class 8, attribute 5, mean = 0.50, std=0.01
Class 8, attribute 6, mean = 0.00, std=0.01
Class 8, attribute 7, mean = 0.46, std=0.08
Class 8, attribute 8, mean = 0.23, std=0.02
Class 9, attribute 1, mean = 0.55, std=0.14
Class 9, attribute 2, mean = 0.56, std=0.15
Class 9, attribute 3, mean = 0.51, std=0.06
Class 9, attribute 4, mean = 0.20, std=0.06
Class 9, attribute 5, mean = 0.50, std=0.01
Class 9, attribute 6, mean = 0.00, std=0.01
Class 9, attribute 7, mean = 0.53, std=0.05
Class 9, attribute 8, mean = 0.24, std=0.04
Class 10, attribute 1, mean = 0.78, std=0.05
Class 10, attribute 2, mean = 0.73, std=0.11
Class 10, attribute 3, mean = 0.48, std=0.09
Class 10, attribute 4, mean = 0.33, std=0.06
Class 10, attribute 5, mean = 1.00, std=0.01
Class 10, attribute 6, mean = 0.00, std=0.01
Class 10, attribute 7, mean = 0.55, std=0.02
Class 10, attribute 8, mean = 0.23, std=0.01
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Testing : –

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Classification accuracy=0.4504
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