

Ques no: 14

CreditScore

RiskClass(TD) | Entropy

720	0
690	0
710	0
680	0
700	0
610	1
640	1
620	1
630	1
650	1

CreditScore	RiskClass	Bin
720	0	High
690	0	Medium
710	0	High
680	0	Medium
700	0	High
610	1	Low
640	1	Low
620	1	Low
630	1	Low
650	1	Medium

5 Samples for RiskClass 0 (low risk)

5 Samples for RiskClass 1 (high risk)

For RiskClass: 0

Credit Scores: [720, 690, 710, 680, 700]

$$\text{Mean} = \bar{x}_0 = \frac{720 + 690 + 710 + 680 + 700}{5} = 700$$

$$\text{Var}_0 = \frac{(720-700)^2 + (690-700)^2 + (710-700)^2 + (680-700)^2 + (700-700)^2}{4} = \frac{1000}{4} = 250$$

For RiskClass: 1

Credit Scores: [610, 640, 620, 630, 650]

$$\text{Mean} = \bar{x}_1 = \frac{610 + 640 + 620 + 630 + 650}{5} = 630$$

$$\text{Var}_1 = \frac{(610-630)^2 + (640-630)^2 + (620-630)^2 + (630-630)^2 + (650-630)^2}{4} = 250$$

$$\text{Var} = \frac{1}{n-1} \sum (x_i - \bar{x})^2$$

For Risk Class = 0

High: 3/5

Medium: 2/5

$$H_0 = - \left(\frac{3}{5} \log_2 \frac{3}{5} + \frac{2}{5} \log_2 \frac{2}{5} \right) = 0.970$$

For Risk Class = 1

Low: 4/5

Medium: 1/5

$$H_1 = - \left(\frac{4}{5} \log_2 \frac{4}{5} + \frac{1}{5} \log_2 \frac{1}{5} \right) = 0.722$$

Ques-15:

Applicant	Age	Creditscore	Riskclass
A	25	610	1
B	30	640	1
C	35	620	1
D	40	680	0
E	45	700	0
F	50	720	0

□ Visual Intuition

RiskClass = 1 (Low Risk): (25, 610), (30, 640), (35, 620)

RiskClass = 0 (High Risk): (40, 680), (45, 700), (50, 720)

□ Identify Support Vectors

Class 1 support vector: (35, 620)

Class 0 - " : (40, 680)

□ Support Vectors

$x_1 = (35, 620) \rightarrow \text{Class 1}$

$x_2 = (40, 680) \rightarrow \text{Class 0}$

$$v = x_2 - x_1 = (40-35, 680-620) = (5, 60)$$

B. Mid point

$$m = \left(\frac{35+40}{2}, \frac{620+680}{2} \right) = (37, 650)$$

C. Find Perpendicular Vector

Perpendicular Vector to $v = (5, 60)$ is $w = (-60, 5)$

$$w_1x + w_2y + b = 0$$

$$-60(37.5) + 5(650) + b = 0$$

$$-2250 + 3250 + b = 0$$

$$b = -1000$$

D. Hyperplane Equation:

$$-60x + 5y - 2000 = 0$$

$$\Rightarrow 12x - y + 200 = 0$$

Ques 16:

$$\|x_4 - x_1\|^2 = 0$$

$$x_1 = [25, 610] \quad \|x_1 - x_2\|^2 = (25-30)^2 + (610-640)^2 = 92$$

$$x_2 = [30, 640] \quad \|x_1 - x_2\|^2 = (25-35)^2 + (610-620)^2 = 200$$

$$x_3 = [35, 620] \quad \|x_1 - x_3\|^2 = 0 \quad \|x_1 - x_3\|^2 = (30-35)^2 + (610-620)^2 = 425$$

$$y = 0.1 \quad \|x_1 - x_2\|^2 = 0$$

$$K(x_1, x_2) = \exp(-0.1 \times 0) = 1$$

$$K(x_1, x_3) = \exp(-0.1 \times 925) \approx 4.6 \times 10^{-41}$$

$$K(x_1, x_4) = \exp(-0.1 \times 200) \approx 2.06 \times 10^{-9}$$

$$K(x_2, x_3) = 1$$

