height = 170 weight = 57

Height	Weight	Class	Distance	Rank
167	51	Underweight	45	5
182	62	Normal	169	8
176	69	Normal	180	9
173	64	Normal	58	6
172	65	Normal	68	7
174	56	Underweight	17	4
169	58	Normal	2	1
173	57	Normal	9	3
170	55	Normal	4	2

Here, value of K=3. So, we will take the least 3 values which are 2, 4, 9.

2 ⟶ Normal

4 ⟶ Normal

9 ⟶ Normal

So, height = 170 (cm) and weight = 57 (gm) in 'Normal' class.

Ans:

DBSCAN :

P1 : (3,7) , P2 : (4,6) , P3 : (5,5) , P4 : (6,4) , P5 : (7,3) , P6 : (6,2)

P7 : (7,2) , P8 : (8,4) , P9 : (3,3) , P10 : (2,6) , P11 : (3,5) , P12 : (2,3)

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
P1	0											
P2	1.41	0										
P3	2.83	1.41	0									
P4	4.24	2.83	1.41	0								
P5	5.66	4.24	2.83	1.41	0							
P6	5.83	4.47	3.16	2	1.41	0						
P7	6.4	5	3.61	2.24	1	1	0					
P8	5.83	4.47	3.16	2	1.41	2.83	2.24	0				
P9	4	3.16	2.83	3.16	4	3.16	4.12	5.10	0			
P10	1.41	2	3.16	4.47	5.83	5.66	6.40	6.32	3.16	0		
P11	2	1.41	2	3.16	4.47	4.24	5.00	5.10	2	1.41	0	
P12	3.16	2.83	3.16	4	5.10	4.47	5.39	6	1.41	2	1.41	0

P1 : P2, P10

P2 : P1, P3, P11

P3 : P2, P4

P4 : P8, P5

P5 : P4, P6, P7, P8

P6 : P5, P7

P7 : P5, P6

P8 : P5

P9 : P12

P10 : P1, P11

P11 : P2, P10, P12

P12 : P9, P11

minPts = 4 and epsilon (ε) = 1.9

Point	status	
P1	Noise	Border
P2	Core	
P3	Noise	Border
P4	Noise	Border
P5	Core	
P6	Noise	Border
P7	Noise	Border
P8	Noise	Border
P9	Noise	
P10	Noise	Border
P11	Core	
P12	Noise	Border

Padding (Borders Problem solves)

$$O = \left[\frac{i - k + 2p}{s}\right] + 1$$

$$= \left[\frac{5 - 3 + 2*1}{1}\right] + 1$$

$$= \frac{2+2}{1} + 1$$

$$= 5$$

6	14	17	11	3
14	12	12	17	11
8	10	17	19	13
11	9	6	14	12
6	4	4	6	4

Pooling ⟶ max pooling
average pooling

14	17
11	19

max Pooling

11.5	14.25
9.5	14.0

Average Pooling

$$F_1 \text{ Score} = \frac{2 \times P \times R}{P + R}$$

$$= \frac{2 \times \frac{3}{5} \times \frac{3}{5}}{\frac{3}{5} + \frac{3}{5}}$$

CNN

Kernal = Filter

Stride

Padding

Pooling

3	3	2	1	0
0	0	1	3	1
3	1	2	2	3
2	0	0	2	2
2	0	0	0	1

0	1	2
2	2	0
0	1	2

12	12	17
10	17	19
9	6	14

$$\text{Output} = (i - K) + 1$$

$$= (5 - 3) + 1$$

$$= 2 + 1$$

$$= 3$$

$$\text{Output}, O = \left[\frac{i - K}{s}\right] + 1$$

$$= \left[\frac{5 - 3}{2}\right] + 1$$

$$= \frac{2}{2} + 1 = 2$$

Confusion Matrix

Actual value	Prediction	Terms
1	0	FN
0	1	FP
1	1	TP
0	0	TN
0	0	TN
1	1	TP
0	1	FP
1	0	FN
1	1	TP

* Let,
0 → Negative
1 → Positive

Confusion Matrix

		Actual value P	Actual value N
Prediction	P	TP = 3	FP = 2
	N	FN = 2	TN = 2

Precision, $P = \frac{TP}{TP+FP}$

$= \frac{3}{3+2}$

$= \frac{3}{5}$

Recall, $R = \frac{TP}{TP+FN}$

$= \frac{3}{3+2}$

$= \frac{3}{5}$

Logistic Regression

x_1	x_2	y
1	2	0
2	3	1
3	4	1
4	5	1

$g(h(x)) \geq 0.5 = \text{class 1}$

$g(h(x)) < 0.5 = \text{class 0}$

Parameter optimization: $\theta_0 = 1$, $\theta_1 = 1$, $\theta_2 = 2$

Hypothesis function:

$$h(x) = g(\theta_0 + \theta_1 x_1 + \theta_2 x_2 + \dots + \theta_n x_n)$$

$$h_1(x) = g(1 + 1 + 4) = g(6)$$

$$g(h(x)) = \frac{1}{1+e^{-x}} = \frac{1}{1+e^{-6}} = 0.997$$

$= \text{class 1}$

$$h_2(x) = g(1 + 2 + 6) = g(9)$$

$$g(h(x)) = \frac{1}{1+e^{-x}} = \frac{1}{1+e^{-9}} = 0.99 = \text{class 1}$$

$$h_3(x) = g(1 + 3 + 8) = g(12)$$

$$g(h(x)) = \frac{1}{1+e^{-12}} = 0.99 = \text{class 1}$$

$$h_4(x) = g(1 + 4 + 10) = g(15)$$

$$g(h(x)) = \frac{1}{1+e^{-15}} = 0.99 = \text{class 1}$$

$\hat{y}$	true label	Cost
0	0	0
0	1	α
1	0	α
1	1	0