

K-Mean Algorithm →

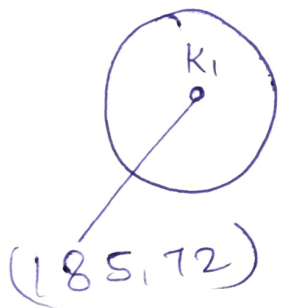
①

In this algorithm we are given k and we have to produce k clusters.

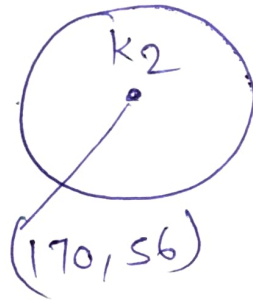
for example →

we have to produce $k=2$ cluster for this data set.

	Height	weight
1	185	72
2	170	56
3	168	60
4	179	68
5	182	72
6	188	77
7	180	71
8	180	70
9	183	84
10	180	88
11	180	67
12	177	76



Centroid of K_1



Centroid of K_2

Euclidean Distance

$$\sqrt{(x_0 - x_c)^2 + (y_0 - y_c)^2}$$

observed value centroid value

ED for
for 3rd
row

$$K_1 = \sqrt{(168 - 185)^2 + (60 - 72)^2} = 20.80$$

$$K_2 = \sqrt{(168 - 170)^2 + (60 - 56)^2} = 4.48$$

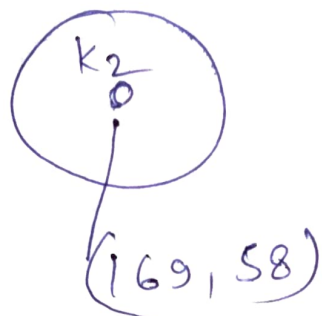
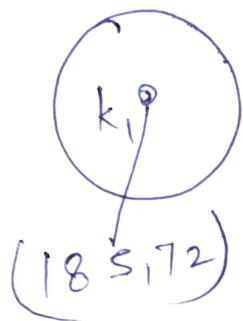
$$K_1 \rightarrow \{1, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$

$$K_2 \rightarrow \{2, 3\}$$

We will choose Min Value so 4.48 is Min.
So 3 will group up with K_2 .

New Centroid calculation

$$\text{for } K_2 = \left(\frac{170 + 168}{2}, \frac{60 + 56}{2} \right) = (169, 58)$$

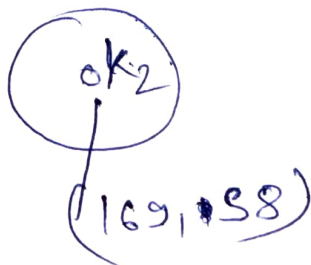
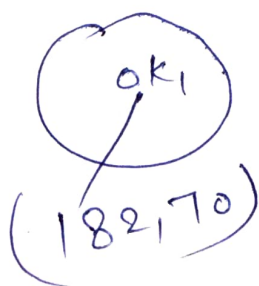


$$\begin{aligned} \text{ED for } K_1 \rightarrow K_1 &= \sqrt{(179 - 185)^2 + (68 - 72)^2} \\ \text{(for 4th row)} & \Rightarrow 6.32 \\ (179, 68) & \end{aligned}$$

$$\begin{aligned} K_2 &= \sqrt{(179 - 169)^2 + (68 - 58)^2} \\ & \Rightarrow 14.14 \end{aligned}$$

Min is 6.32 so 4th row will go in K_1
New Centroid for K_1

$$K_1 = \left(\frac{185 + 179}{2}, \frac{72 + 68}{2} \right) \Rightarrow (182, 70)$$



$$ED \text{ for } k_1 = \sqrt{(182-182)^2 + (72-70)^2} = 2 \quad (3)$$

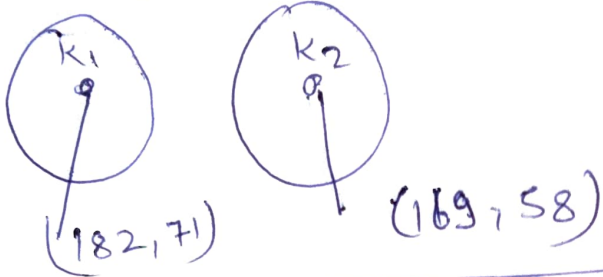
5th row
(182, 72)

$$k_2 = \sqrt{(182-169)^2 + (72-58)^2} \Rightarrow 19.02$$

Min is 2 so 5 row will go in k_1

New Centroid for k_1

$$\left(\frac{182+182}{2}, \frac{72+70}{2} \right) = (182, 71)$$



$$ED \text{ for } k_1 = \sqrt{(188-182)^2 + (77-71)^2} \Rightarrow 8.4$$

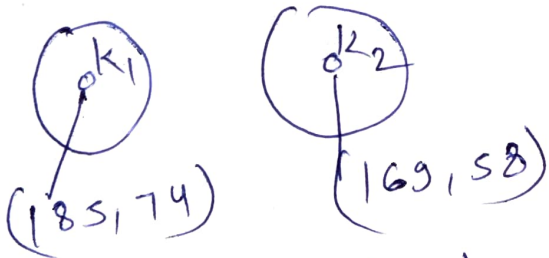
for 6th row ~~k2~~

$$(188, 77) \quad k_2 = \sqrt{(188-169)^2 + (77-58)^2} \Rightarrow 21.95$$

Min 8.4 so 6 row will go in k_1

New Centroid for k_1

$$\left(\frac{188+182}{2}, \frac{77+71}{2} \right) = (185, 74)$$



$$\text{for 7th row } ED \text{ for } k_1 = \sqrt{(180-185)^2 + (71-74)^2} = 5.8$$

(180, 71)

$$k_2 = \sqrt{(180-169)^2 + (71-58)^2} = 17.02$$

$k_1 = 5.8$ is Min so row 7th will go in

k_1