(1.0)	Ossume that the data set Dis given by the table below.
<del>- "</del>	Follow complète linkage technique to find clusters in D. Use Euclidean distance measure.
	II. Luciidean distance measure.
	Con Carcaracti Contracti
	Points A. B.
	1 2 DIE 16 10 10 22 10 10 10 10 10 10 10 10 10 10 10 10 10
	P2
	P3 9 3
	$\rho_{\alpha}$
	- 3 PS 7 (25) - 7 8.5 (- 17) (1. (11(-17) ] - 4. (17)
DOIN.	Pr, Pz, Ps are center of each electer
	Number of Cluster K=3
	Initial cluster Centres be ( = 4, (2,4)
	C <sub>1</sub> = P <sub>3</sub> (9,3) ( <sub>3</sub> = P <sub>5</sub> (8.5,1)  Ludidian distance formula
	Ludidian distance formula
	Distance $I(x,y)$ ; $(a,b)J = -\sqrt{(x-a)^2 + (y-b)^2}$
	# : [1] - [4] - [
	Iteration 1: 462, 10 10 10 10 10 10 10 10 10 10 10 10 10
	P, C2,4)
	(Distance [ (2,4), (2,4)] = 7(2-2) + (4-4) = 0 > small
	Distance L(24), 9,3) = 7 (2-9)2 + (4-3)2 = 7.07
	Distance L (2,4), (1.5,1) = 7(2-8.5) 2+(4-1)2 = 7.15
	P1 (2,4) belongs to cluster (1.
	P. ( P 2 )
	12(0,4)
	Distance (10, L) (2, 4) J = 0(8-2) + (2-4) = 6.32
1	1) notance [(1,2), (9,3)] = V (1-9)2+(2-3)2 = 1.41
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P2 (8,2) belongs to pluster (3. Distance [9,3), [2,4)] =  $\sqrt{(9-2)^2 + (3-4)^2}$  = 7.07 Distance [9,3), [9,3)] =  $\sqrt{(9-9)^2 + (3-3)^2}$  = 0  $\Rightarrow$  small Distance  $[(9,3), (8.5, 1)] = \sqrt{(9-8.5)^2 + (3-1)^2}$  = 2.06 1/3 (9,3) belongs to iluster (2. Distance [(1,5), (2,4)] = V(1-2)2+ (5-4)2= 1.414 < small Distance L(1,5),  $(9,3) = \sqrt{(1-9)^2 + (5-3)^2} = 8.24$ Distance L(1,5);  $(8.5,i) = \sqrt{(1-8.5)^2 + (5-1)^2} = 8.5$ Py (1,5) belongs to cluster (1. Distance [(8.5,1), (2,4)] = - (8.5-2)2+(1-4)2 = 7.15. Distance  $L(8.5,1), (9,3) = \sqrt{(8.5-9)^2 + (1-3)^2} = 2.06$ Distance [(8.5,1), (85,1)) = 7 (8.5-85)2+ (1-1)2= 0 -> small Ps(8.5, 1) belongs to cluster: C3. After iteration! Claster (1= [f1 (2,4), f4 (1,5)]

Claster (2= [f3 (9,3)]

Claster (3= [f2 (3,2), f5 (8.5,1)] Iteration 2 Centers of new clusters Muster C1 = 12+1:+ 4+5 cluster (3 = [8+8.5, 2+1]= Sundaram

Distance [2,4], (.5,4.5) =  $\sqrt{(2-1.5)^2+(4-4.5)^2}$  = 0.707  $\rightarrow$  small distance [2,4], (9,3)  $J = \sqrt{(2-9)^2+(4-3)^2}$  = 7.07 Dutance [(2,4),(8.25,1.5)]=V(2-8.25)2+(9-1.5)2= 6.73 P. (2,4) belongs to cluster (1 Distance  $[(9,2), (0.5, 4.5)] = \sqrt{(9-1.5)^2 + (2-45)^2} = 6.96$ istance (8,2), (9,3) ] = V (8-9)2+(2-3)2 = Distance [(8,2), (8.15,1.5) = 7 (8-8.25)2+(2-1.5)2= 0.55-> small T (8,2) belongs to Cluster (3 istana (C9,3), (1.5,4.5) ]= \( (9-1.5)^2 + (3-4.5)^2 = 7.64 (9,3),(9,3) =  $\sqrt{(9-9)^2+(3-3)^2}$ Distance [ (9,3), (8.25,1.5)] = V(9-8.25)2+ (3-1-5)2 = 1.677 1/3 (9,3) belongs to elester (2 Distance [(1,5), (1.5, 4.5)] = V(1-1.5)2+(5-4.5)2 = 0.707 -> small  $(1,5), (9,3) = 1 (1-9)^2 + (5-3)^2 = 8.24$ Distance [(1,5), (8.25,1.5)] = V(1-8.25)2+ (5-1.5)= 8.05 Py (1,5) belongs to distor ( Distance [(1,50,1), (1.5,4.5)] = 1 (8.5-1.5)2+ (1-4.5)2 = 7.8 Distance [(8.5,1), (9.3)] =  $\sqrt{(8.5-9)^{22}+(1-3)^{2}}=2.06$ Distance [(8.5,1), (9.25,1.5)) =  $\sqrt{(8.5-9)^{22}+(1-3)^{2}}=0.55$ P5(8.5,1) belongs to cluster C3 FOR EDUCATIONAL USE Gundaram

After Iteration 2 Clustere C1 = [P, (2,4), Py (1,5)] Clustere (2 = [P2 (8,2); P5 (8.5,1)] Clustere (3 = [P2 (8,2); P5 (8.5,1)] Comparing the electering of iteration, and iteration 4, we find that objects does not move cluster anymore. Thus, the computation of the k-Mean Clustering has reached its. Stability and no more stereation is needed. PUS) (p(0,4) P3C1,3) P2(0,4) P3(PS,I) Clustering after last iteration Sundaram) FOR EDUCATIONAL USE

,	
0.2	(PAM) to cluster the coordinates into Good -
	(PAM) to elester the coordinates into Gwo -
	distor
	Objects X
	7
· ·	3
0.10	2 9
-	9 6
	8 5
	5 5
	100 100 ( 100 Hom han 70 ) 6000 In 1882 over 10
. 3.	7
	3 7 5
	9 40 40 5
0	[ - [ ^ ] : [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [ [
0000	Ottop1: - ule select l'andon representative objects
	(Object)? x y q Distance (cost = C
	0 8 17 4 9 $18-41+17-9) = 6$
0	$\frac{1}{3}$ $\frac{3}{4}$ $\frac{4}{9}$ $\frac{3-41+17-9}{17-9}=3$
,	3 9 6 9 9 19-41+16-91=8
	y 9 18-41+ (5-9) = 8
	5 9 49 [5-4] + 18-9] = 2
	6 7 3 49 19-41+13-9 = 9
	1 5 49 15-91=7
	9 4 5 49 14-41+ [5-9] = 4
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Water Jak	Object(i) x y C2 Distance (cost c
	0 8 7 8 4 18-8) + 17-4) 3
	1 3 7 8 4 [3-8] + 17-4] 8
	3 9 6 8 4   9-81 +   6-4 3
	4 8 5 8 4 18-81+ 15-41 1
	5 5 8 8 y [5-8]+  8-4] 7
	6 7 3 8 4 [7-8] + [3-4] 2
	8 7 5 8 y (7-8/+ (5-4) 2
	9 4 5 8 4 [4-8]+  5-4] 2
	Compare cost of cost(C1) and cost(C2) for every i and
	Compare cost of cost(C1) and cost(C2) for every i and select the minimum one.
	Step 2: The cluster are
	Chuster 1: 9 (3, 1), (9, 9), (5, 8), (9, 5) 9
	Otep2: - the cluster are Cluster 1: 9 (3,7), (4,9), (5,8), (4,5) 4 Cluster 2: 8 (8,7), (9,6), (8,5), (7,3), (8,4), (7,5) 4
	Calculate total cost
	$T \cos f(x, c) = \sum_{i=1}^{n}  x_i - c_i $
	Total cost = of cost (8,4), (8,7)), (00+ (8,4), (9,6)).
	(08+ (CR4), (8,5)), cost (CR4), (5,5), cost (C4, 9), (8,7))
	Cost ((4,9), (5,8)), cost ((4,9), (5,8)), cost ((4,9), (4,5))
	= (3+3+1+2+2) + (2+2+4)
	=11+9=20
	Alten 3:- select one of non-medoids o
	Let 09 = (8,5) i.e. Object (4)
	Oh nout medoid are Cicago and Or (x.5).
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	Object(i) x y Q' Distance cost C	-
	0 8 7 8 5   8-8) + 17-5  2	
	1 3 7 8 5 (3-8/4/7-5) 7	
	3 9 6 8 5 19-81+ 18-51 2	
	5 5 8 8 5  S-11+[P-5] 6	
	6 7 3 8 5 7-8/4 (3-5) 3	
	1 8 9 85 18-81 1	
	8 7 5 85 h-81+ [5-5] 1	
<u>#</u>	9 4 5 8 5 14-81+ 15-51 4	1
		7
	Object(i) x y C Distance cost C	N. S
	0 8 7 4 9 18-41 + 17-9 6	
	1 3 7 4 9 12-4) + 17-91 3	/ <sup>2</sup>
<u>[</u>	3 9 6 9 9 19-4) + 16-91 8	
	5 5 9 9 9 15-41 + 18-91 2	, '
	6 7 3 4 9 [7-4] + [3-9] 9	
	7 8 4 4 9 1-41 + 14-91 9	
	P 1-7.5 9 9 17-41 + 15-91 7	
	9 4 5 4 9 (4-4) + (5-9) 4	
	(Co. 0000 of 000) of 000 (Co. 000) o	
	Compare the cost of cost (C1) and cost (0°) energy	-
	and sellet the minimum one	
	again ouate the destor.	
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		1
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3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3		

Cluster 1: 8 (3,7), (5,8), (4,5), (4,9) 3 Cluster 2: 8 (8,7), (9,6), (7,3), (8,4), (7,5), (8,5) } Current total cost = (2+2+3+1+1) + (3+2+4) 9+9=18 Stepy: Do cost of swapping medoid from C, to 09 is S= inverent total Ocost - part total cost = 11-20 = -2<0 moving 0' reould be a good idea Now; Omore cluster again Selict one of non-medoids
Let 0" = (7,3) i.e. object (6) Do nove midoid are (, (4,9), and 01 (7,3 Distance Cost object (i) x 8-417-91 2-4/+17-91 9-41+ 16-91 9 18-41 + 1 5-91 5 15-41+18-9 18-41+14-9 Ц 17-41+15-91 9 14-4/+15-91 FOR EDUCATIONAL USE Sundaram

	Object(i) x y 0" Distance cost c	
	0 8 7 7 3 (8-7)+17-31 5	,
	1 3 7 7 3 13-71+17-3) 8	
	3 9 6 7 3 19-71+16-3) 5	
	4 8 5 1 3 18-71+ 5-3] 3	
	5 5 8 1 3 15-71+18-31 7	
	7 8 4 1 3 18-71+ 14-3) 2	-
	8 7 5 1 3 17-71+15-3) 2	
0	9 4 5 7 3 14-71+15-31 5	
	again verate the cluster Claster 1: { (2,7), (5,8), (4,5), (4,9) }	
	Cluster 2: \(\(\delta7\), (9,6), (8,5), (8,4), (7,5), (7,3)\(\frac{1}{3}\)	
	((W) 10 2 . 2(8) 1), (1,6), (6,3), (6,3), (6,3)	7. 7.
	ewerent total cost = (3+2+4) + (5+5+3+2+2)	
	= 9+17	
	= 26	1
		-
	So cost of suapping medoid from 69 to 011 is	
	S= europent total that rost - Part total lost	
	8 = 26-19 = 870	
	Do moving o' could be a bad idea so previous	
	So moving o' could be a bad idea so previous choire was good.	
		- 1
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