, 150 (30)

CS584 Machine Leasining Assignment-3

1. Problem1: Lloyd's Method

Given a data set with seven data points 24, - 14 and the distance between all Pains of data Points are in the following table.

	x, in o	x2	×3	y4	25	2 3
	×2 5	7.0	4	6	1	7 8
	*2 5	F F H	10	A A	3	5 6
3	25 8 6	1 6	0	40	3	5 6
2	25 86	5 11	3	7	5	2)(
P	25 8 6 PRANTE	07	5	a ¹	8	o l
	26 Page 2	8	6	2	9	16
	0 1					

AMUME

no.g cluster K=2.

cluster centres are initialized to be xz and 26.

a 6 Romes.

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Given,

no of clusters (K)-2

initialized cluster Centres

. Cluster 1 (283) = 3

cluster 2 (xc) = 6

from above the distance matrix.

×2 ×3 14 25 16 de 27 0 5 6 0 4 6 1 1 7 5 4 0 4 3 3 X3 6 9 50 7889 8 9 X4. 3 7 5 1 80 25 2 9 7889 1 0 2 26 7 8 . 6 = 1 2 0 1 100 24 3

charles centres are instalized in ter

1. 5 Points what's the two clusters formed at the end of the first iteration of Cloyd's algorithm? In first iteration of the clustering Proces: cluster (x, center) contains data points: : ((2=10+10) | x1/2/2/25 4 clustor 2 (x center) contain data points: (2 d x2, x4, x6, x7 9 The clusters are updated as. The Center for cluster one (1) calculated as. mean goists data point: (x1+ x3+25)/3 = x, + x3 + x5tob p: cluster for center is 3. $\frac{2}{2}$ $\frac{3+3+3}{3}$ = $\frac{9}{3}$ = $\frac{3}{3}$ Ec 2 to to 3. the center for cluster 2. calculated as mean of its data point: (22+24+x6+27)/4 H= 22 + 24 + 26 + 27 14141 = 4 F = 1 + 1 + 1 + 1 106 ABNOWN ON 411 MIT FOR TO 100 Cluster for centre 2 = 2.25

2. 5 Points. whats the Two classers frames at the end of the selond iteration of 1 10 y d's algorithm'? ino first iteration of the constant transfers. In second Iteration of elustroomy Process. cluston 1 (23 (centon=5)): Data points will be : 1.31, 23,25) cluster 2 (lenter = 2.25) Data points will be { 22, 24, 26, 223 The Control for cluster one (1) calculated as. To get new claster centers we should do the mean of data Points in each cluster. * New cluster 1 (entrer = 21+23+25 the eight on the chisten 9. calculated of cluster 1 center = 3. (क्रम् १६६० १६६० । जिल्ला क्रिकेट कर्म + New cluster & center = 'x2 + x4 + x6 + x7 H- 11. + 11. + 18. + 19 1 5 1 - 2.25 we can see that there is no change in

the both Iteration I and Iteration 2. It can leads to converge of the algorith (It converged).

so we can add 2 and 3 is 5:

y to establish that PEX) conferme 3: 10 Points what's the two clusters formed = when the 1 loyd's algorithm bonvoigus?

result often convergence:

upon convoigence y the lloyd's algorithm Two distinct clustous émerge:

cluster. (center ats) contains

cluster 2 (center at 2.25) contains.

dota points 8 22 xy, 26, x73

they were the Two clustors formed when the lloyd's algorith converges.

(312)9 bus (497 jo nothally) price plant

9(36): 201 8 EL - 8 EK (11k -1 Kn 162k)

(71K=1KO(X)**K) \$ \$ \$ 2K)

Problem & (15 Points): town to the

solution: i boo a bbo and sur or

In oxder to establish that P(x) Conforms

to a Gaussian Mixture Model (GMM), we

must calculate P(x) by aggregating P(x)

must calculate P(x) by aggregating P(x)

P(x|z) across ajjurteasible z values.

algorith (It contespes).

Plagantk = 1k out to the out

2000, lets Consider P(x/z). its given

P(x12)= (TR 2 1KN(x1 WK, EK) ZK

Since Reach zk Camtake value o.or 1 the Som over all Possible value of z can be written as sum of all zk Possible combinations.

 $P(x) = 2 \neq 1 \leq 2 = 2 \neq k p(2) P(x/2)$ by using definition of P(2) and P(2/2). $P(x) = 2 \neq 1 \leq 2 = 2 \neq k \leq k p(2) \neq k \leq k \leq k p(2)$ $P(x) = 2 \neq 1 \leq 2 = 2 \neq k \leq k p(2) \neq k p(2) \leq k p(2)$ $|\pi k = 1 k p(x) p(x/2) | |\pi k = 1 k p(x/2) p$

.. TK is I and all other one o.

7K 6 80,19

2K = 1 KEK = 1

·: P(x) = ZK = IK (TKN (X14K, EK))

.: P(x) is inadeed) a GMM

with specific form. Hence Provedy

P(x), obtaining by Summin P(z) P(x 1z) over

all possible values of z, is a GMM

P(x) = E P(E) P(x|C)

= = TKN(x1MK,2K)