Assi5

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1 Conceptual Questions (5 points)

1.a

K-Means is sensitive to noisy data and outliers, because it calculated the center by average of the dataset, and the outliers or noise can affect the mean, thus the K centers would be meaningless.

1.b

No.

1.c

Hierarchical clustering can be applied in more distance function while k-means get a good result merely in Euclidean distance.
Hierarchical clustering did not need the specific K – the number of clusters.

2 Advanced Classification: Perceptron (5 points)

x_1	x_2	y
0	0	+
0	1	+
1	0	+
1	1	-

Table 1: Data points with class labels

If y != sign($w^T x$), update $w = w + \eta * x * y$

	iter1	sign	$\eta*x*y$-4	iter2	sign	$\eta*x*y$-1	iter3	sign
W0	0.25		-0.5	-0.25		0.5	0.25	
W1	0.25		-0.5	-0.25		0	-0.25	
W2	0.25		-0.5	-0.25		0	-0.25	
Y1	0.25	1		-0.25	-1		0.25	1
Y2	0.5	1		-0.5	-1		0	1
Y3	0.5	1		-0.5	-1		0	1
Y4	0.75	1		-0.75	-1		-0.25	-1

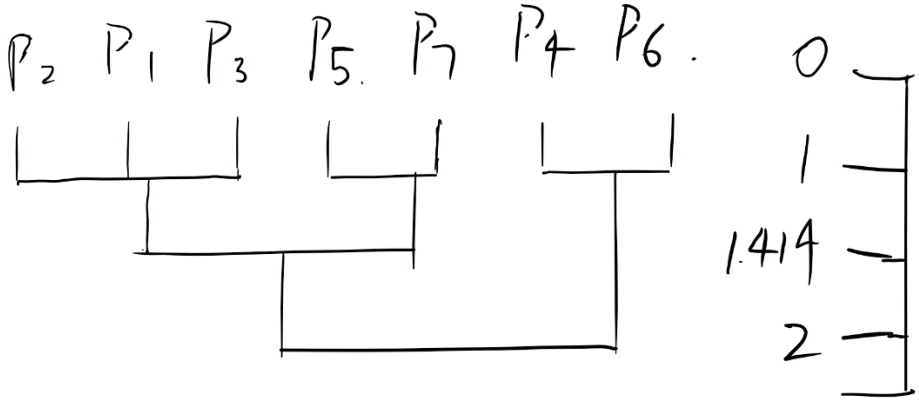
3 Hierarchical Agglomerative Clustering and B-Cubed Evaluation (8 points)

Point	x	y	Ground Truth
P1	1	1	C1
P2	1	2	C1
P3	2	1	C1
P4	5	1	C2
P5	3	2	C1
P6	5	2	C2
P7	3	3	C1

Table 2: Data Points

3.a.

L1 (value = 1): C1(P1, P2, P3), C2(P4, P6), C3(P5, P7);
L2 (value = 1.414): C4(P1, P2, P3, P5, P7), C5(P4, P6);
L3 (value = 2): C6(P1,P2, P3, P4, P5, P6, P7).



3.b

There would be C1(P2, P1, P3), C2(P4, P6), C3(P5, P7)

3.c

Precision 1= 3/3 =1
Precision 2= 2/2 = 1
Precision 3= 2/2 = 1

Final Precision = 1

Recall1 = 3/5 = 0.6
Recall2 = 2/2 = 1
Recall3 = 2/5 = 0.4

Final Recall = (Recall 1*3+ Recall 2*2+ Recall 3*2) * (3+2+2) = 0.657