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Assignment 7 – CS 271

Professor Mark Stamp

Problems 2, 4, 5, 7, 8, 13, 16

**2.**

a. With respect to clustering, rAD = -1 is the ideal case, where the inverse correlation between the corresponding elements of the adjacency matrix A and the distance matrix D is as large as possible. Ideally, we want the distance matrix to be small when aij = 1 and large otherwise. That is, in the ideal case, we want a large inverse correlation between the elements of 2 matrices.

Note: the rAD = -1, implies that all data points lie on a regression line with negative slope.

b. rAD near 1 implies that all data points lie on the regression line with positive slope.

**4.**

**Diagram

Description automatically generated**

**5.**

**Chart, scatter chart

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**Chart, scatter chart

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Description automatically generated**

**7.**

**pji probabilities for the second E step:**

**p\_1,1 = 0.8938**

**p\_2,1 = 0.1062**

**p\_1,2 = 0.6046**

**p\_2,2 = 0.3954**

**p\_1,3 = 0.9370**

**p\_2,3 = 0.0630**

**p\_1,4 = 0.4641**

**p\_2,4 = 0.5359**

**p\_1,5 = 0.8266**

**p\_2,5 = 0.1734**

**8.**

**initial guess:**

**t = (0.7000, 0.3000) theta = (0.6000, 0.5000)**

**After 51 iterations, EM converged to:**

**t = (0.5228, 0.4772) theta = (0.7934, 0.5139)**

**13.a**

**[[ 1.98160168 54.00001977]**

**[ 4.17329924 82.49999211]]**

**[1 0 0 1 0 1 0 0 1 1 0 1 1 1 0 0 1 0 1 0]**

**13.b**

**[[ 3.81221867 79.06278761]**

**[ 1.97315387 51.9992806 ]**

**[ 0. 0. ]]**

**[0 1 0 0 1 0 1 1 0 0 1 0 0 0 0 1 0 1 0 1]**

**13.c**

**[[ 3.81221813 79.0627808 ]**

**[ 0. 0. ]**

**[ 1.97315393 51.99927975]]**

**[0 2 0 0 2 0 2 2 0 0 2 0 0 0 0 2 0 2 0 2]**

**13.**

**initial guess:**

**t = (0.7500, 0.1000, 0.1500)**

**theta\_1 :**

**u\_1 =**

**[[ 3.5]**

**[55. ]]**

**s\_1=**

**[[ 1.2 5.8]**

**[ 5.8 120. ]]**

**theta\_2 :**

**u\_2 =**

**[[ 4.5]**

**[75. ]]**

**s\_2=**

**[[ 2.4 9. ]**

**[ 9. 200. ]]**

**theta\_3 :**

**u\_3 =**

**[[ 2.5]**

**[58. ]]**

**s\_3=**

**[[ 1. 6.]**

**[ 6. 125.]]**

**After 1000 iterations, EM converged to:**

**t = (0.3286, 0.1714, 0.5000)**

**theta\_1 :**

**u\_1 =**

**[[ 1.7815]**

**[52.9012]]**

**s\_1=**

**[[ 9.2854e-03 -2.3000e-02]**

**[-2.3000e-02 1.7897e+01]]**

**theta\_2 :**

**u\_2 =**

**[[ 2.3652]**

**[56.1059]]**

**s\_2=**

**[[1.3152e-01 1.4506e-02]**

**[1.4506e-02 1.8450e+01]]**

**theta\_3 :**

**u\_3 =**

**[[ 4.1733]**

**[82.5 ]]**

**s\_3=**

**[[ 0.2538 1.2653]**

**[ 1.2653 15.8504]]**

**Chart, scatter chart

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**Chart, scatter chart

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**Chart, scatter chart

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**16.**

**Chart, scatter chart

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