سیاوش حسن پور تمرین 2

1) (22, 1, 42, 10) and (20, 0, 36, 8)

a) $\sqrt{(22-20)^2+(1-0)^2+(42-36)^2+(10-8)^2}$

b) $|22-20|+|1-0|+|42-36|+|10-8| =$

c) $\sqrt[3]{(22-20)^3+\ (1-0)^3+\ (42-36)^3+(10-8)^3}$

d) max($|22-20|$, $|1-0|$, $|42-36|$, $|10-8|$) =

2) (a)

#Euclidean distance:

D(x1,x) = $\sqrt{(1.5-1.4)^2+(1.7-1.6)^2} = 0.1414$

D(x2,x) = $\sqrt{(2-1.4)^2+(1.9-1.6)^2} = 0.6708$

D(x3,x) = $\sqrt{(1.6-1.4)^2+(1.8-1.6)^2} = 0.2828$

D(x4,x) = $\sqrt{(1.2-1.4)^2+(1.5-1.6)^2}$ = 0.2236

D(x5,x) = $\sqrt{(1.5-1.4)^2+(1-1.6)^2} = 0.6082$

Ranking = x1 , x4 , x3 , x5 , x2

#Manhattan distance:

D(x1,x) = |1.5-1.4| + |1.7 – 1.6| = 0.1 + 0.1 = 0.2

D(x2,x) = |2-1.4| + |1.9-1.6| = 0.6 + 0.3 = 0.9

D(x3,x) = |1.6-1.4| + |1.8-1.6| = 0.2 + 0.2 = 0.4

D(x4,x) = |1.2-1.4| + |1.5-1.6| = 0.2 + 0.1 = 0.3

D(x5,x) = |1.5-1.4| + |1-1.6| = 0.1 + 0.6 = 0.7

Ranking = x1 , x4 , x3 , x5 , x2

#Supremum distance:

D(x1,x) = max(| 1.5 – 1.4 | , | 1.7 – 1.6 |) = max(0.1 , 0.1) =0.1

D(x2,x) = max(| 2 – 1.4 | , | 1.9 – 1.6 |) = max(0.6 , 0.3) = 0.6

D(x3,x) = max(| 1.6 – 1.4 | , | 1.8 – 1.6 |) = max(0.2 , 0.2) = 0.2

D(x4,x) = max(| 1.2 – 1.4 | , | 1.5 – 1.6 |) = max(0.2 , 0.1) = 0.2

D(x5,x) = max(| 1.5 – 1.4 | , | 1 – 1.6 |) = max(0.1 , 0.6) = 0.6

Ranking = x1 , x3 , x4 , x2 , x5

#cosine similarity:

d1.d = (1.5 * 1.4) + (1.7 * 1.6) = 2.1 + 2.72 = 4.82

||d1|| = $\sqrt{1.5 * 1.5 + 1.7 * 1.7}$ = 2.2671

||d|| = $\sqrt{1.4 * 1.4 + 1.6 * 1.6}$ = 2.1260

cos(x1,x) = $\frac{d1.d6}{||d1||\ ||d6||} = 1.000030$

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d2.d = (2 * 1.4) + (1.9 * 1.6) = 2.8 + 3.04 = 5.84

||d2|| = $\sqrt{2 * 2 + 1.4 * 1.4} = 2.4413$

||d|| = 2.1260

cos(x2,x) = $\frac{d2.d6}{||d2||\ ||d6||} = 1.125196$

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d3.d =(1.6 * 1.4) + (1.8 * 1.6) = 2.24 + 2.88 = 5.12

||d3|| = $\sqrt{1.6 * 1.6 + 1.8 * 1.8} = 2.4083$

||d|| = 2.1260

cos(x3,x) = $\frac{d3.d6}{||d3|| * ||d6||}$ = 0.999991

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d4.d = (1.2 * 1.4) + (1.5 * 1.6) = 1.68 + 2.4 = 4.08

||d4|| = $\sqrt{1.2 * 1.2 + 1.5 * 1.5} = 1.9209$

||d|| = 2.1260

cos(x4,x) = $\frac{d4.d6}{||d4||\ ||d6||} = 1.000817$

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d5.d = (1.5 * 1.4) + (1 * 1.6) = 2.1 + 1.6 = 3.7

||d5|| = $\sqrt{(1.5 * 1.5) + 1} = 1.8027$

||d||= 2.1260

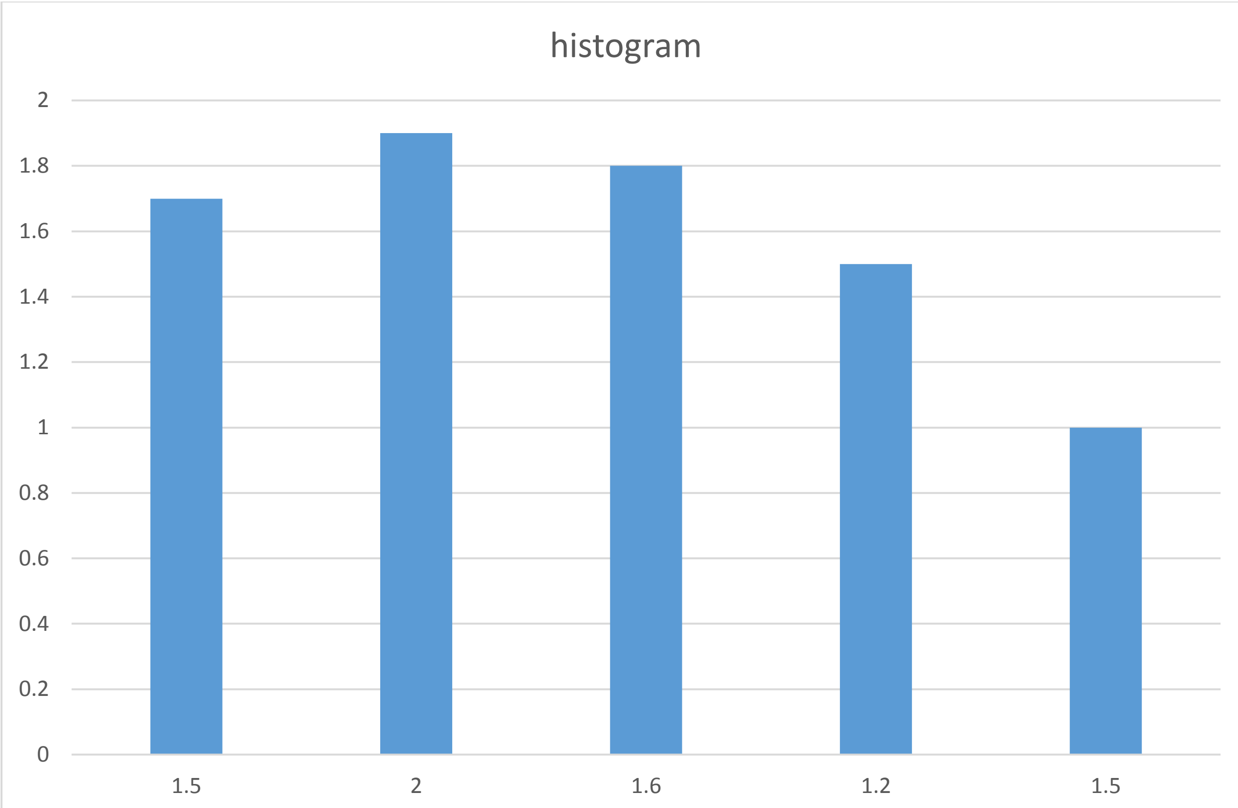
cos(x5,x) = $\frac{d5.d6}{||d5||\ ||d6||}$ =0.965417

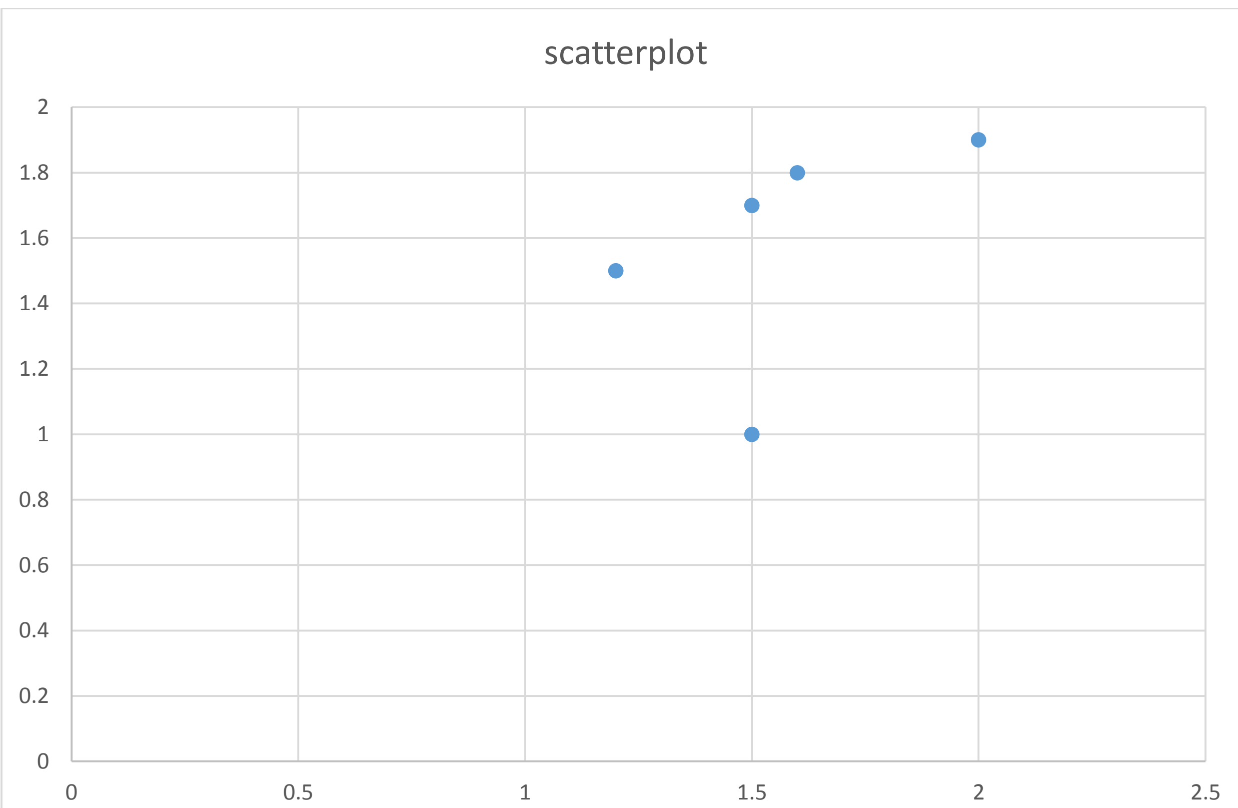
Ranking = x5 , x3 , x1 , x4 , x2

c)

سیاوش حسن پور

تمرین 2





3)

There are three methodes to handle ratio-scaled variables for computing the dissimilarity between objects.

1 # treat ratio-scaled variables like interval-scaled variables. This , however ,is not usual a good choice since it is likely that the scale may be distorted.

2 # apply logarithmic transformation to a ratio-scaled variable f having value x_{if} for object I by using the formula $y_{if} = \log(x_{if})$. the y_{if} values can be treated as interval valued. Notice that for some ratio-scaled variables, log-log or other transformation may be applied, depending on the variable's definition and the application.

3 # treat x_{if} as continues ordinal data and treat their ranks as interval-valued.