# **Distance Measures**

## **QUESTION 1**:

Consider the following three vectors u, v, w in a 6-dimensional space:

$$u = [1, 0.25, 0, 0, 0.5, 0]$$
  

$$v = [0.75, 0, 0, 0.2, 0.4, 0]$$
  

$$w = [0, 0.1, 0.75, 0, 0, 1]$$

Suppose cos(x,y) denotes the similarity of vectors x and y under the cosine similarity measure. Compute all three pairwise similarities among u,v,w.

Assignant 3 Distruce weaponer, Neavest-	Neighbor Tavarre
Assignant 3 Brothers	
22000000	
Scootin 1	
2 vectors are i u-[1,0.15,0,0:0.5,0]	24
u= 1,0.25,0,0.05,0	U.V.
	101.101
W= [0,0.1,0.95,0,0,1]	€ U.V \ZU2×\EV2
or (4,4) = 1x2+5+025x0+0x0+0x02+0.5x0.4	1.0
11+0.25+0+0+0.5+0 . JOHS+0-4	0+40-2+40-4+6
	S Tree
= 0.98 + 0.2 0.95	
1.1456 x 0.8932	(4)
(a) (a) (b)	
96 9 198	36)
cas(u,w) = 0.25 x0.1	
VI.3185 * VI.3725	6-101
	X
= 6.025	- 75
1.146 - 1.369	201
= 0.025 = 0.00	
1.437	
(x(V,W)= 0	
6.8732 × 1.854	
> 0	

## **QUESTION 2**:

Here are five vectors in a 10-dimensional space:

Compute the Jaccard distance (not Jaccard "measure") between each pair of the vectors.

	Question 2
	Rive vector are
	V = 1111 0 0000 0
	6 = 0100100101
	c= 0000011110
	D = Oliminit
	$\epsilon$ = [01][[1][]
	to the total districts.
_	Jaccard distance = 1 - Jaccard similarity
(0)	Rothern A and B
- 300	Jaccard rim = IAMB = 1/7
	AOB
-	Jaccard distance = 1-914 = 94
	Jaccard Dispare = 1 1/4 14
(B)	Between 4 and C
(0)	perveen of pres
	Incorrel sign = 0
	Jaccard distance = 1-0 =1
	-/ACCAGA CALIFORNIC
_	
(9)	Between A and D
	Jaccard sim = 3
	Jaccard distance = 1 - 3/10 = 7/10
-	
(D)	between A and E
	The state of the s
	Jaccard sim = 3/10
	James distance = 1-3/10
	= 3/6
100	10

6	between B and C
-(0)	Jacard Sim = 1/2
	Jaccard distance = 1 - 1/7
	Sociard australia = 4/2
<b>(£)</b>	between a and D  Jacard Sim = 49
	Jaccard distance = 1 - 4/9
	2 5/9
3	between B and E Jaccord sim = 3/10
	Jaccard distance = 1-3/10
h	between C and D  Jacrard sim = 4/9
	Jaccard distance = $1-4/q$
7	between cand F
	Jaccard sim = 4/q
	Jaccard distance = 1-4/q
-	= %

KALKIE CAA	D and F vectors
Jaccare	1 sim = 8/10
Jaccord	distance = 1-8/10
	=2/10 = 1/5

# **QUESTION 3**:

Here are five vectors in a 10-dimensional space:

Compute the Manhattan distance ( $L_1$  norm) between each two of these vectors.

Olvestion 3	ding to units
	I - Washington and July
A = 1111000000	
B = 0[00[00 tot	9 has d when
C=00000HI10	2 - matrix collectively
D = 0111111111	
E= 1011111111	
	International Property of the Control of the Contro
Manhattan distance i	is absolute sum of differences, bi
	201/S-Y+1 = 100/85 453
between A and B	Tout have all may the
Manhattan distance	
	IS-C+E - Marking the
	l'a
Between A and C	2
Manhattan distance	
	and trees and many
Between A and D	
Manhaltan distance =	7
between A and E	
M. I Ilan distruct	e = 7
I'Ugi Macillo i Casales	
	and the second second second
Between B and C Manhattan distance	-
11 Hour distance	* 5

between B and E

between B and E

Manhattan distance = 7

between C and D

Manhattan distance = 5

between a C and E

Manhattan Distance = 5

between D and E

Manhattan Distance = 2

## **QUESTION 4**:

The edit distance is the minimum number of character insertions and character deletions required to turn one string into another. Compute the edit distance between each pair of the strings **he**, **she**, **his**, and **hers**.

```
Question 4

'He', 'she', 'his', 'hers'

Edit distance = x + y - 2[\(\chi(x,y)\)]

1st pair 'He' and 'she'

\(\chi(x) = 2\)

edit distance = 2 + 3 - 2(2)

=1

2nd pair 'he' and 'his'

\(\chi(x) = 1\)

edit distance = 2 + 3 - 2(1)

= 3

2nd pair 'he' and 'hers'

\(\chi(x) = 2\)

edit distance = 2 + 41 - 2(2)

edit distance = 2 + 41 - 2(2)
```

4th pair 'She' and his'

LCS = & 1

edit distance = 3+3-2(4)

= & 4

Sth pair 'She' and hers'

LCS = 2

edit distance = 3+4-2(2)

= 3

6th pair 'his' and hers.

LCS = &

edit distance = 3+4-2(2)

= 3