

Given five vectors in a 10-dimensional space:

A      B      C      D      E  
1111000000 0100100101 000000111001111111 1011111111

Q1 Jaccard distance =  $1 - \frac{1}{7} = 6/7$   
(A, B)

$$A, C = 1 - \frac{0}{8} = 1$$

$$A, D = 1 - \frac{3}{10} = 7/10$$

$$(A, E) = 1 - \frac{3}{10} = 7/10$$

$$(B, C) = 1 - \frac{1}{7} = 6/7$$

$$(B, D) = 1 - \frac{4}{9} = 5/9$$

$$(B, E) = 1 - \frac{3}{10} = 7/10$$

$$(C, D) = 1 - \frac{4}{9} = \frac{5}{9}$$

$$(C, E) = 1 - \frac{4}{9} = \frac{5}{9}$$

$$(D, E) = 1 - \frac{8}{10} = 2/10$$

③ Manhattan distance for the same points

in 10-D space

$$\begin{aligned} (A, B) &= |(1-0)| + |1-1| + |1-0| + |1-0| + |0-1| + |0-1| \\ &\quad + |0-0| + |0-0| + |0-1| + |0-1| \\ &= 6 \end{aligned}$$

(A, C)

$\approx 8$ ; (A, D) = 7; (A, E) = 7; (B, C) = 6; (B, D) = 5;

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(B, E) = 7; (C, D) = 5; (C, E) = 5;

④ he, she ; edit distance = 1

he, hq ; edit distance = 3

he, hen ; edit distance = 2

she, his ; edit distance = 4

she, best , edit distance = 3

his, hen ; edit distance = 3

=====.

MMDS

# Assignment - 3

① given,

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

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

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

$$\begin{aligned} |u| &= \sqrt{1^2 + 0.25^2 + 0^2 + 0^2 + 0.5^2 + 0^2} \\ &= \sqrt{1 + 0.625 + 0.25} \\ &= 1.145 \end{aligned}$$

$$\begin{aligned} |v| &= \sqrt{0.75^2 + 0^2 + 0^2 + 0.2^2 + 0.4^2 + 0^2} = 0.873 \\ |w| &= \sqrt{0^2 + 0.1^2 + 0.75^2 + 0^2 + 0^2 + 1^2} = 1.25 \end{aligned}$$

(a)  $\cos(u, v) = \frac{u \cdot v}{|u| \cdot |v|} = \frac{0.75 + 0.02}{1.145 \cdot 0.873} \Rightarrow \theta = 18^\circ$

(b)  $\cos(v, w) = \frac{v \cdot w}{|v| \cdot |w|} = \frac{0 \times 0.75 + 0 \times 0.75 + 0^2 \times 0 + 0.4 \times 0.1}{0.873 \times 1.25}$

$$\begin{aligned} &= 0 \\ \theta &= 90^\circ \end{aligned}$$

(c)  $\cos(u, w) = \frac{1 \times 0 + 0.25 + 0 + 0 + 0 + 0}{1.145 \cdot 1.25}$