Assignment - 3

Distance Measured

(1) Given,

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

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

$$\omega = [0, 0.1, 0.75, 0, 0, 1]$$

$$|u| = \sqrt{1^2 + (0.25)^2 + (0.5)^2} = 1.145$$

$$|v| = \sqrt{(0.75)^2 + (0.2)^2 + (0.4)^2} = 0.873$$

$$|\omega| = \sqrt{(0.1)^2 + (0.75)^2 + 1^2} = 1.25$$

a) $\cos(u, v) = \dfrac{u \cdot v}{|u|\,|v|}$

$$= \frac{0.95}{1.145 \times 0.873} = 0.95$$

$$\theta = 18^\circ$$

b) $\cos(v, \omega) = \dfrac{v \cdot \omega}{|v|\,|\omega|} = 0$

$$\theta = 90^\circ$$

c) $\cos(u, \omega) = \dfrac{u \cdot \omega}{|u|\,|\omega|} = \dfrac{0.025}{1.145 \times 1.25}$

$$= 0.017$$

$$\theta = 89^\circ$$

(2) Given vectors are -

A = 1 1 1 1 0 0 0 0 0 0
B = 0 1 0 0 1 0 0 1 0 1
C = 0 0 0 0 0 1 1 1 1 0
D = 0 1 1 1 1 1 1 1 1 1
E = 1 0 1 1 1 1 1 1 1 1

Jaccard distance = 1 - Jaccard Similarity

JS (A, B) = 1/7 ⇒ JD (A, B) = 1 - 1/7 = 6/7
JS (A, C) = 0 ⇒ JD (A, C) = 1 - 0 = 1
JS (A, D) = 3/10 ⇒ JD (A, D) = 1 - 3/10 = 7/10
JS (A, E) = 3/10 ⇒ JD (A, E) = 1 - 3/10 = 7/10
JS (B, C) = 1/7 ⇒ JD (B, C) = 1 - 1/7 = 6/7
JS (B, D) = 4/9 ⇒ JD (B, D) = 1 - 4/9 = 5/9
JS (B, E) = 3/10 ⇒ JD (B, E) = 1 - 3/10 = 7/10
JS (C, D) = 4/9 ⇒ JD (C, D) = 1 - 4/9 = 5/9
JS (C, E) = 4/9 ⇒ JD (C, E) = 1 - 4/9 = 5/9
JS (D, E) = 8/10 ⇒ JD (D, E) = 1 - 8/10 = 2/10

(3) For the above vectors we need to find the manhattan distance

It is the sum of differences b/w bit vectors

MD (A, B) = 6
MD (A, C) = 8
MD (A, D) = 7
MD (A, E) = 7
MD (B, C) = 6
MD (B, D) = 5
MD (B, E) = 7
MD (C, D) = 5
MD (C, E) = 5
MD (D, E) = 2

(4) Given, A = He C = his

B = she D = hers

Edit distance = |x| + |y| − 2 |LCS(x, y)|

ED (A, B) = 2 + 3 − 2(2) = 1

ED (A, C) = 2 + 3 − 2(1) = 3

ED (A, D) = 2 + 4 − 2(2) = 2

ED (B, C) = 3 + 3 − 2(2) = 2

ED (B, D) = 3 + 4 − 2(3) = 1

ED (C, D) = 3 + 4 − 2(2) = 3