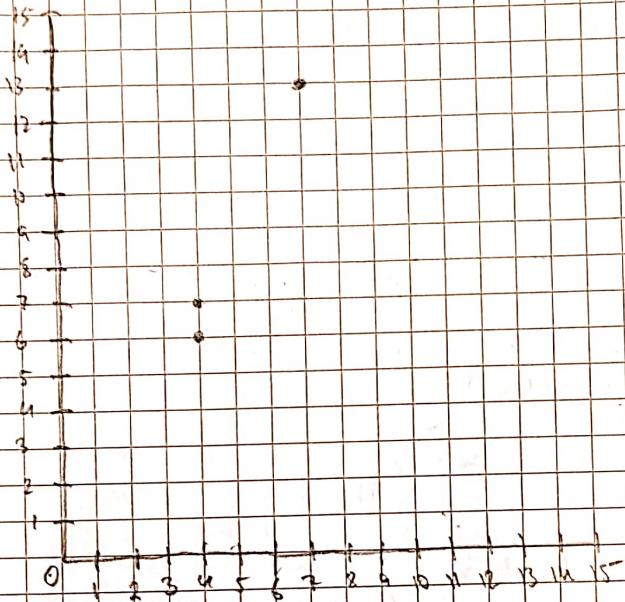


A 1 Shiladzam: 9 - REI

$$x = (4, 4, 7) \quad y = (6, 7, 13)$$

$$(4, 6) \quad (4, 7) \quad (7, 13)$$



$$\|x\| = \sqrt{x_1^2 + x_2^2 + \dots + x_n^2}$$

$$\|x\| = \sqrt{4^2 + 4^2 + 7^2}$$

$$= \sqrt{16 + 16 + 49}$$

$$= \sqrt{32 + 49}$$

$$= \sqrt{81}$$

$$= 9$$

$$\|y\| = \sqrt{6^2 + 7^2 + 13^2}$$

$$= \sqrt{36 + 49 + 169}$$

$$= \sqrt{344 + 50 + 170}$$

$$= \sqrt{50 + 200}$$

$$= \sqrt{150} \approx 15.94$$

$$\|x - y\| = 9 - 15.94$$

$$= -6.94$$

$$z = x - y = (4 - 6, 4 - 7, 7 - 13)$$

$$= (-2, -3, -6)$$

$$\|z\| = \sqrt{(-2)^2 + (-3)^2 + (-6)^2}$$

$$= \sqrt{4 + 9 + 36}$$

$$= \sqrt{49} = 7$$

A2

def knn(x, y):

nn = x[0]

for i in range(len(x)):

if la.norm(y - x[i]) <= nn:

nn = x[i]

return nn

A3

$$x = (1, 3, 3, 9) \quad e = (1, 1, 1, 1)$$

a)

$$\text{std}(x) = \sqrt{\frac{(x_1 - \text{avg}(x))^2 + \dots + (x_n - \text{avg}(x))^2}{n}}$$

$$n = 4$$

$$\text{avg}(x) = \frac{1+3+3+9}{4} = \frac{16}{4} = 4$$

$$\text{std}(x) = \sqrt{\frac{(1-4)^2 + (3-4)^2 + (3-4)^2 + (9-4)^2}{4}}$$

$$= \sqrt{\frac{9+1+1+25}{4}} = \sqrt{\frac{36}{4}} = \sqrt{\frac{18}{2}} = \sqrt{\frac{9}{1}} = \sqrt{9} = 3$$

$$b) \text{std}(2x + e)$$

$$\text{std}(2x) = 2 \text{std}(x) = 2 \cdot 3 = 6$$

$$\text{std}(2x + e) = 6$$

$$c) Z = \frac{1}{\text{std}(x)}(x - \text{avg}(x))$$

$$= \frac{1}{3}(-3, -1, -1, 5)$$

$$(-1, -\frac{1}{3}, -\frac{1}{3}, \frac{5}{3})$$

A9

$$\arccos\left(\frac{x^T y}{\|x\| \|y\|}\right)$$

$$x = (4, 4, 7)$$

$$y = (6, 7, 13)$$

$$x^T y = (4 \cdot 6 + 4 \cdot 7 + 7 \cdot 13) = 24 + 28 + 91 = 143$$

$$\|x\| = \sqrt{9}$$

$$\|x\| \|y\| = \sqrt{9} \sqrt{254}$$

$$\|y\| = \sqrt{254} = 15.94$$

$$\text{Winkel} = \arccos\left(\frac{143}{\sqrt{9} \sqrt{254}}\right) \approx 4.97^\circ$$

B

D)

(1, 2)

(2, u)



(1, 2)

(2, 3)



2)

$$8x = +3$$

$$- 7x = +u$$

$$x = -1$$

$$8x + 3 = 0$$

$$7x + u = 0$$

$$15x + 7 = 0$$

$$8x = y + 3$$

$$7x = y - u$$

$$8x - 3 = y$$

$$7x + u = y$$

$$x = -1$$

$$8 \cdot -1 = 53 + 3 \quad y = 53$$

$$7 \cdot -1 = 53 - u$$

BB

a)

$$A = \{(1, 2, 3), (0, 1, 2), (0, 2, 1)\}$$

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b)

$$(3, 2, 4)$$

$$A(1, 2, 3) + B(0, 1, 2) + C(0, 2, 1) = (3, 2, 4)$$

$$A = 3$$

$$B = -2$$

$$C = -1$$

$$(3, 6, 9) + (0, -2, -4) + (0, -2, -1)$$

$$(3+0+0, 6-2-2, 9-4-1) = (3, 2, 4)$$

$$a = 3$$

$$2a + b + 2c = 2$$

$$3a + 2b + c = 4$$

$$C1 \quad x = (2, 4, 7, 1) \quad x\text{-sum} = 14$$

$$y = (a, b, c, d)$$

$$2a + 4b + 7c + d = \|x\| \cdot \|y\| \cdot \cos(90^\circ) = 0$$

$$y = [3, -2, 1, -5]$$

C2

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$