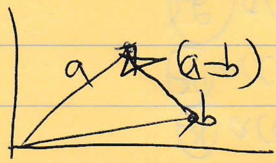
2019/12/02

Substraction of Vector

$a - b = c$

$b + c = a = b + (a - b)$



Euclidean Distance

↳ "ordinary" straight-line distance between two points.

$$\|a-b\| = \sqrt{\sum_{i=1} (a_i - b_i)^2} = \sqrt{\sum_{i=1} (a_i^2 - 2a_ib_i + b_i^2)}$$

$$= \sqrt{\sum_{i=1} a_i^2 + \sum_{i=1} b_i^2 - 2a_ib_i} = \sqrt{\|a\|^2 + \|b\|^2 - 2a^Tb}$$

$$\|a-b\|^2 = \|a\|^2 + \|b\|^2 - 2a^Tb$$

example) Let's say we have fourth dimensional data as below,

$D_1 = \{3, 2, 0, 2\}$

$D_2 = \{1, 2, 3, 0\}$

$D_3 = \{2, 2, 2, 2\}$

If I would like to find the distance between D_1, D_2, D_3 and $Q = \{1, 5, 0, 0\}$, I can use Euclidean Distance to figure it out.

$$\text{dist}(D_1, Q) = \sqrt{(3-1)^2 + (2-5)^2 + 0 + (2-0)^2} = \sqrt{17}$$

$$\text{dist}(D_2, Q) = \sqrt{(1-1)^2 + (2-5)^2 + (3-0)^2 + 0} = \sqrt{18}$$

$$\text{dist}(D_3, Q) = \sqrt{(2-1)^2 + (2-5)^2 + 2^2 + 2^2} = \sqrt{18}$$