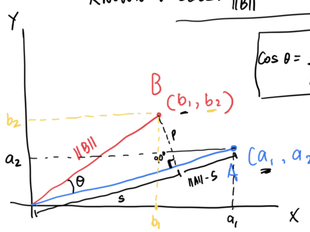


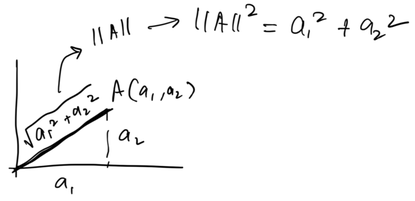
KNOWN VALUES: $B \to (b_1, b_2)$ $\|B\|$ $\quad A \to (a_1, a_2)$ $\|A\|$

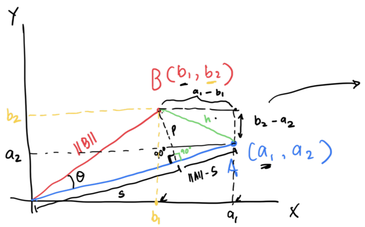


$\cos\theta = \frac{S}{\|B\|} \Rightarrow S = \|B\| \cdot \cos\theta$

$\cos\theta$ / $\cos(A,B)$

- 1 ⇒ maximally sim
- 0 ⇒ Independent
- −1 ⇒ minimally similar.





$$h^2 = (a_1 - b_1)^2 + (a_2 - a_2)^2$$
$$= a_1^2 + b_1^2 - 2a_1b_1 + b_2^2 + a_2^2 - 2a_2b_2$$
$$= a_1^2 + a_2^2 + b_1^2 + b_2^2 - 2(a_1b_1 + a_2b_2)$$
$$= \|A\|^2 + \|B\|^2 - 2(A \cdot B)$$

$W \cdot X$

$$\begin{pmatrix} w_1 \\ w_2 \\ \vdots \end{pmatrix} \cdot \begin{pmatrix} x_1 \\ x_2 \\ \vdots \end{pmatrix} \Rightarrow \begin{pmatrix} w_1 x_1 \\ w_2 x_2 \\ \vdots \end{pmatrix}$$

$w_1x_1 + w_2x_2 \ldots$

$\|B\|^2 = S^2 + P^2$

$P^2 = \|B\|^2 - S^2$

$h^2 = P^2 + (\|A\| - S)^2$

$P^2 = h^2 - (\|A\| - S)^2$

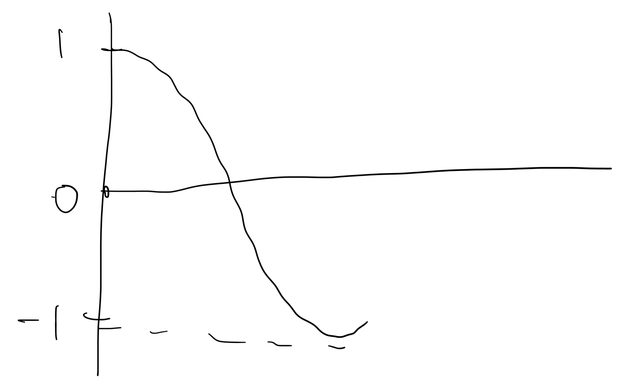
$$h^2 = \|A\|^2 + \|B\|^2 - 2A \cdot B$$

$$h^2 = P^2 + (\|A\| - S)^2$$
$$= \|B\|^2 - S^2 + (\|A\| - S)^2$$
$$= \|B\|^2 - S^2 + \|A\|^2 + S^2 - 2\|A\|S$$
$$= \|B\|^2 + \|A\|^2 - 2\|A\|\|B\|\cos\theta \quad (S = \|B\|\cos\theta)$$

$$\|A\|^2 + \|B\|^2 - 2A \cdot B = \|A\|^2 + \|B\|^2 - 2\|A\|\|B\|\cos\theta$$

$$\Rightarrow A \cdot B = \|A\|\,\|B\|\cos\theta$$

$$\Rightarrow \cos\theta = \frac{A \cdot B}{\|A\|\,\|B\|} \Rightarrow \frac{A}{\|A\|} \cdot \frac{B}{\|B\|}$$



diff ← $-1 \leq \quad \leq 1$ → same

