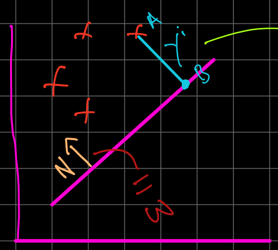

Find γ_i

$\frac{w}{\|w\|}$ = unit normal vector

→ vector w/ magnitude of 1 w/ the same direction of $\overline{AB}$.

$x_i = A$, meaning

$$x_i - \gamma' \cdot \frac{w}{\|w\|} = B$$

$$w^T \underline{x} + b = 0$$

$$w^T\left(x_i - \gamma_i \cdot \frac{w}{\|w\|}\right) + b = 0$$

Solve for γ_i!

1. Distribute w^T

$$w^T x_i - \gamma_i \frac{w \cdot w^T}{\|w\|} + b = 0$$

2. Simplify $\frac{w \cdot w^T}{\|w\|}$

$$w^T x_i - y_i \frac{\|w\|^{\cancel{2}}}{\cancel{\|w\|}} \sim \|w\|$$

3. Subtract b

$$w^T x_i - y_i \|w\| + \cancel{b} = 0$$

$$-\cancel{b} \quad -b$$

4. Subtract $w^T x_i$

$$w^T x_i - \gamma_i \|w\| = -b \quad - w^T x_i$$
$$\cancel{- w^T x_i}$$

5. Divide by $-\|w\|$.

$$\frac{-\gamma_i \|w\|}{-\|w\|} = \frac{-b - w^T x_i}{-\|w\|}$$

Now you have the equation that solves for γ!

$$\boxed{\gamma = \frac{b + w^T x}{\|w\|}}$$

Last thing, make it work w/ both sides of the eq. (1, -1)

↓

Simply add the sample label either 1, or -1 as y_i.

Written as:

$$\boxed{\gamma_i = y_i \left(\frac{w^T x_i + b}{\|w\|} \right)}$$ ✓

Hope you enjoyed!

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