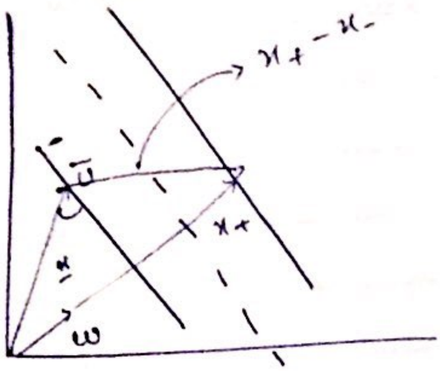
$\text{width of street} = (x_+ - x_-) \cdot \frac{\overline{\omega}}{\|\omega\|}$ ← vector; → unit vector

$1-b \qquad 1+b \qquad = \frac{2}{\|\omega\|}$



$\overline{\omega} \cdot \overline{u} \geq c \qquad (c = -b)$

[$\overline{\omega} \cdot \overline{u} + b \geq 0$ then +ve

Decision rule]

$\text{MAX} \frac{2}{\|\omega\|}$

$\text{MAX} \frac{1}{\|\omega\|} \longrightarrow \text{MIN} \frac{1}{2} \|\omega\|^2$

$\overline{\omega} \cdot x_+ + b \geq 1$ ← +ve sample

$\overline{\omega} \cdot \overline{x}_- + b \leq -1$
↳ -ve sample

y_i such that $y_i = +1$ for +ve samples
$\underline{\text{generalized eq}^n}$ $= -1$ for -ve samples

$\Rightarrow y_i \left(\frac{x_i}{\overline{\omega}} + b \right) \geq 1$

$L = \frac{1}{2} \|\overline{\omega}\|^2 - \sum \alpha_i \left[y_i (\overline{\omega} \cdot \overline{x}_i + b) - 1 \right]$ — (1)

$y_i (\overline{x}_i \overline{A} + b) - 1 \geq 0$

$y_i (\overline{x}_i \overline{a} + b) - 1 = 0$

For x_i in gutter

$\frac{\partial L}{\partial \overline{\omega}} = \overline{\omega} - \sum \overline{x}_i y_i \alpha_i = 0$

$\Rightarrow \overline{\omega} = \sum \alpha_i y_i \overline{x}_i$ — (2)

$\frac{\partial L}{\partial b} = \boxed{\sum \alpha_i y_i = 0}$ — (3)

Put 2, 3 in 1

$L = \frac{1}{2} \left(\sum \alpha_i y \overline{x}_i \right) \left(\sum \alpha_j y_j \overline{x}_j \right) - \sum \alpha_i y_i x_i \cdot \left(\sum \alpha_j y_j x_j \right) -$

$\underbrace{\sum \alpha_i y_i}_{0} b + \sum \alpha_i \Rightarrow \sum \alpha_i - \frac{1}{2} \sum \alpha_i \alpha_j y_i y_j x_i \cdot x_j$

$$K(x_i \cdot x_j') = \phi(\bar{x}_i) \cdot \phi(\bar{x}_j)$$

Kernel f^n

dot prod in another space

1. Linear Kernel

$$(\bar{U} \cdot \bar{V} + 1)^n \Rightarrow \underline{\underline{n=2}}, n = \ldots ?$$

2. $e^{-\|x_i - x_j\| / \sigma}$