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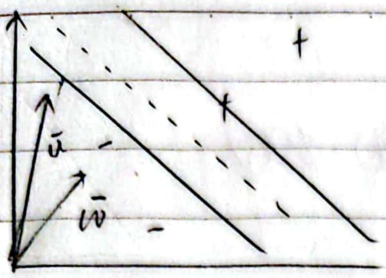


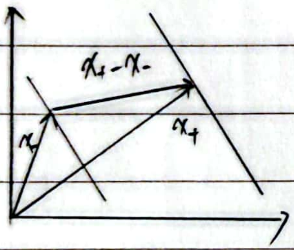
$$\bar{w}\cdot\bar{u} \geq c \qquad c = -b$$

$$\boxed{\begin{array}{l}\bar{w}\cdot\bar{u} + b \geq 0 \\ \text{Decision Rule}\end{array}}$$ ①

$$\bar{w}\cdot\bar{x}_+ + b \geq 1$$
$$\bar{w}\cdot\bar{x}_- + b \leq -1$$

$$y_i \Rightarrow y_i \begin{array}{l} = +1 \text{ for + example} \\ = -1 \text{ for - example}\end{array}$$

$$y_i(\bar{x}_i\bar{w} + b) \geq 1$$
$$\Rightarrow y_i(\bar{x}_i\bar{A} + b) - 1 \geq 0$$
$$\Rightarrow \boxed{\begin{array}{l} y_i(\bar{x}_i\bar{w} + b) - 1 = 0 \\ \text{For } x_i \text{ in Gutter}\end{array}}$$ ②



$$\text{Width} = (\underset{\downarrow\ 1-b}{x_+} - \underset{\downarrow\ 1+b}{x_-}) \cdot \frac{\bar{w}}{\|\bar{w}\|} = \frac{2}{\|\bar{w}\|}$$

$$\text{Max } \frac{2}{\|w\|} \Rightarrow \text{Max } \frac{1}{\|w\|} \Rightarrow \text{Min } \|w\| \Rightarrow \boxed{\text{Min } \frac{1}{2}\|w\|^2}$$ ③

$$L = \frac{1}{2}\|\bar{w}^2\| - \sum \alpha_i[y(\bar{w}\cdot\bar{x}_i + b) - 1]$$

$$\frac{\partial L}{\partial \bar{w}} = \bar{w} - \sum \alpha_i y_i x_i = 0 \Rightarrow \bar{w} = \sum \alpha_i y_i \bar{x}_i$$

$$\frac{\partial L}{\partial b} = -\sum \alpha_i y_i = 0 \Rightarrow \sum \alpha_i y_i = 0$$

$$L = \frac{1}{2}\left(\sum \alpha_i x_i y_i\right)\left(\sum \alpha_j x_j y_j\right) - \left(\sum \alpha_i y_i x_i\right)\cdot\left(\sum \alpha_j y_j x_j\right) - \underbrace{\sum \alpha_i y_i}_{0} b + \sum \alpha_i$$

$$= \boxed{\sum \alpha_i - \frac{1}{2}\sum_i\sum_j \alpha_i \alpha_j y_i y_j \boxed{x_i \cdot x_j}}$$ ④

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$\sum \alpha_i y_i \bar{x}_i \cdot \bar{u} + b \geq 0$ Then +

$\phi(\bar{x})$ $\phi(\bar{x}_i) \cdot \phi(\bar{x}_j)$ to Max

$\phi(x_i) \cdot \phi\, u$

$K(x_i \cdot x_j) = \phi(x_i) \cdot \phi(x_j)$

① $(\bar{u} \cdot \bar{v} + 1)^n$

② $e^{-\frac{\|x_i - x_j\|}{\sigma}}$