

5. (b)  $\xi_i^* = 1 - t^{(i)}((w^*)^T x^{(i)} + b^*)$ . margin hyperplane:  $(w^*)^T x + b = \pm 1$ .

$$\text{distance} = \frac{|(w^*)^T x^{(i)} + b - 1|}{\|w^*\|} \text{ for } t^{(i)} = 1, \frac{|(w^*)^T x^{(i)} + b + 1|}{\|w^*\|} \text{ for } t^{(i)} = -1.$$

$$\Rightarrow \text{distance} = \frac{\xi_i^*}{\|w^*\|} \propto \xi_i^*.$$

(c)

$C \rightarrow \infty$ ,  $\xi_i$  has to be zero.

$$\Rightarrow \min \frac{1}{2} \|w\|^2 \text{ s.t. } t^{(i)}(w^T x^{(i)} + b) \geq 0. \Rightarrow \text{hard-margin SVM. \#}$$