

**7.2** The constraint given by equation 7.5 is:

$$t_n (\mathbf{w}^T \phi(\mathbf{x}_n) + b) \geq 1, \quad n = 1, \dots, N$$

Replacing the 1 with  $\gamma$ , it becomes:

$$t_n (\mathbf{w}^T \phi(\mathbf{x}_n) + b) \geq \gamma, \quad n = 1, \dots, N$$

This corresponds to the maximum margin hyperplane:

$$\begin{aligned} t_n \left( \left( \frac{1}{\gamma} \right) (\mathbf{w}^T \phi(\mathbf{x}_n) + b) \right) &= 1 \\ \implies t_n \left( \left( \frac{\mathbf{w}'}{\gamma} \right)^T \phi(\mathbf{x}_n) + \left( \frac{b}{\gamma} \right) \right) &= 1 \\ \implies t_n (\mathbf{w}'^T \phi(\mathbf{x}_n) + b') &= 1 \end{aligned}$$

where  $\mathbf{w}' = \frac{\mathbf{w}}{\gamma}$  and  $b' = \frac{b}{\gamma}$ .

As mentioned in the first paragraph of page 328, a simple rescaling of  $\mathbf{w}$  and  $b$  gives us the same decision surface, so the solution remains unchanged.