Linear SVM

Classifier: $f(x)=w^Tx+b$

Parameters: w, b

$f(X) \geq 0 \Rightarrow X$ is in category θ_1

$f(X) < 0 \Rightarrow X$ is in category θ_2

Training Data: $T=\{(x_i, y_i)\}$, $i=1, \ldots, |T|$. x_i is a feature vector; $y_i \in \{-1, 1\}$

Goal 1: Correct labeling on training data:

If $y_i=1$ ➔ $w^Tx_i+b \geq 1$

If $y_i=-1$ ➔ $w^Tx_i+b \leq -1$

Constraint

$$\forall i,\ y_i(w^Tx_i+b) \geq 1$$

Goal 2: Maximize margin

Large margin ⇔ Small w^Tw

Objective

$$\text{Minimize } \Phi(w)=w^Tw$$

The optimization problem is quadratic programming with linear constraints