

CSE 250B: Section 5 - Sharad Vikram

1. SVM Decision Rule

We have trained an SVM with an RBF kernel:

$$K(\mathbf{u}, \mathbf{v}) = \exp \left\{ \frac{-(\mathbf{u} - \mathbf{v})^2}{2\sigma^2} \right\}$$

Now we have a set of n support vectors (the training points the SVM keeps) $\{\mathbf{x}^{(i)}\}$, the associated training labels $\{y^{(i)}\}$ and alpha weights $\{\alpha_i\}$.

What is the decision function $h(\mathbf{x})$.

2. Slack

The “soft-margin” SVM includes slack for each variable, allowing it to fit non-linearly separable boundaries, as opposed to the “hard-margin” SVM, which does not have slack.

Consider the soft-margin formulation:

$$\min \frac{1}{2} \|w\|^2 + C \sum_{i=1}^N \xi_i$$

such that $\forall i$

$$\begin{aligned} y_i(w^T x + b) &\geq 1 - \xi_i \\ \xi_i &\geq 0 \end{aligned}$$

What happens to the width of the margin in the following scenarios? Why?

(a) $C \rightarrow 0$

(a) $C \rightarrow \infty$